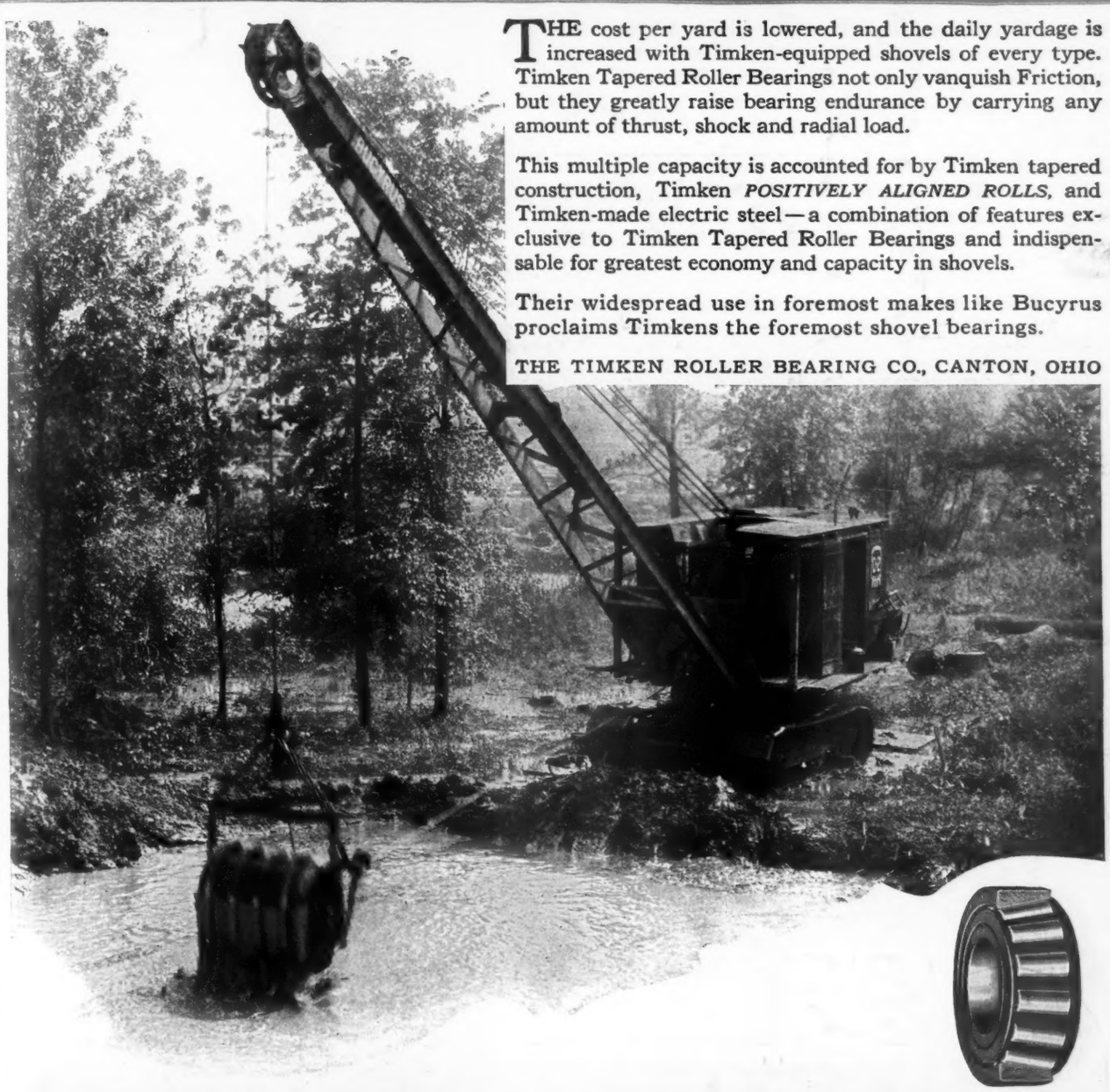
Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS

Founded 1896

Chicago, March 3, 1928 (Issued Every Other Week) Volume XXXI, No. 5



THE cost per yard is lowered, and the daily yardage is increased with Timken-equipped shovels of every type. Timken Tapered Roller Bearings not only vanquish Friction, but they greatly raise bearing endurance by carrying any amount of thrust, shock and radial load.

This multiple capacity is accounted for by Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS*, and Timken-made electric steel—a combination of features exclusive to Timken Tapered Roller Bearings and indispensable for greatest economy and capacity in shovels.

Their widespread use in foremost makes like Bucyrus proclaims Timkens the foremost shovel bearings.

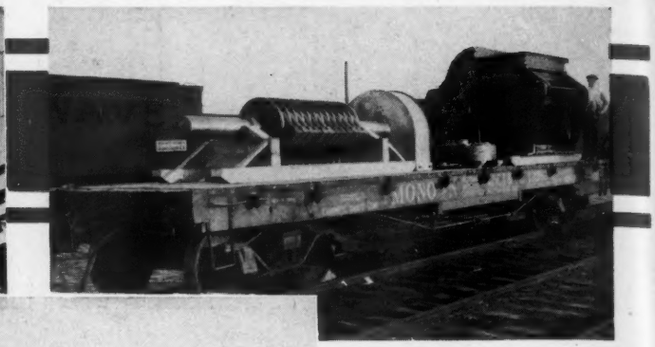
THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN Tapered Roller BEARINGS

MEMBER A. B. C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A. B. P.

Printing of This Issue Is 5350 Copies. Next Issue Will Be March 17

Maule Ojus Rock Co., Ojus, Fla., have a No. 8 Williams, capable of crushing 200 tons per hour 24" limestone to 1¼".



One of two Jumbo crushers for the Atlas Portland Cement Co., Hannibal, Mo. They will replace six gyratories.

Stearns Lime & Stone Co., well known Chicago operators, operate a No. 6 Williams Jumbo crusher.

Why they buy Williams Hammer Crushers

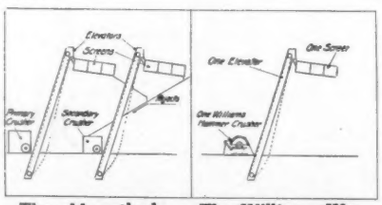
Handle Larger Rock

Williams hammer crushers handle larger rock than any other crusher of equal capacity or cost. For example, the Jumbo type will take rock as shown below—20" to 36" stone—and reduce to 1¼", ¾" or agstone in one operation, one Williams usually replacing a primary crusher and re-crusher.

This size rock handled with ease by the Jumbo type.

50% to 75% Less Investment

As shown by the diagram, all the work can be done in one operation by one Williams Hammer Crusher. Compare this with the old method employing two crushers with their accompanying elevators, drives, extra foundations and larger buildings and you can readily see why investment has been cut 50% to 75% and crushing costs 35% to 53%.



The old method. The Williams Way.

Better Control Over Size of Product

Williams hammer crushers offer a wider range of adjustment and make macadam and concrete stone with no more fines (usually less) than made with gyratories or jaw crushers. Product is cubical in shape with no long slivers to bridge and form air pockets in concrete. More fines for filling voids in traffic and water-bound macadam roads are obtained simply by adjustment of the patented breaker plate.

Note the uniformity of macadam made with the Williams.

A size for every operation. Write us

Williams Patent Crusher & Pulverizer Co.

800 St. Louis Ave., St. Louis, Mo.

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37 W. Van Buren St.

New York
15 Park Row

San Francisco
415 5th Street

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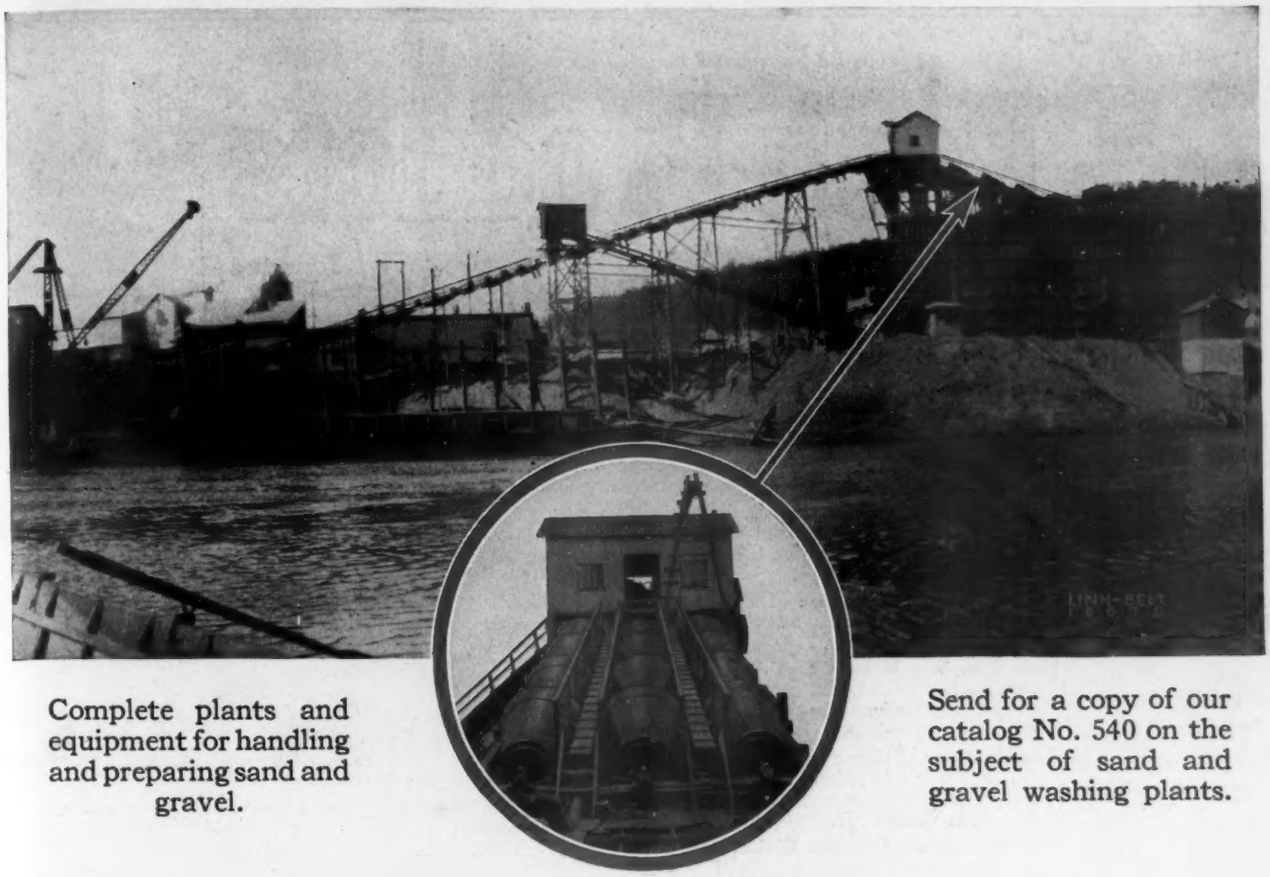
ORIGINAL PATENTEES AND WORLD'S LARGEST BUILDERS OF HAMMERMILLS

PATENT CRUSHERS GRINDERS SHREDDERS



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One set of these screens was installed ten years ago. Since that time two additional sets have been added to give increased capacity.

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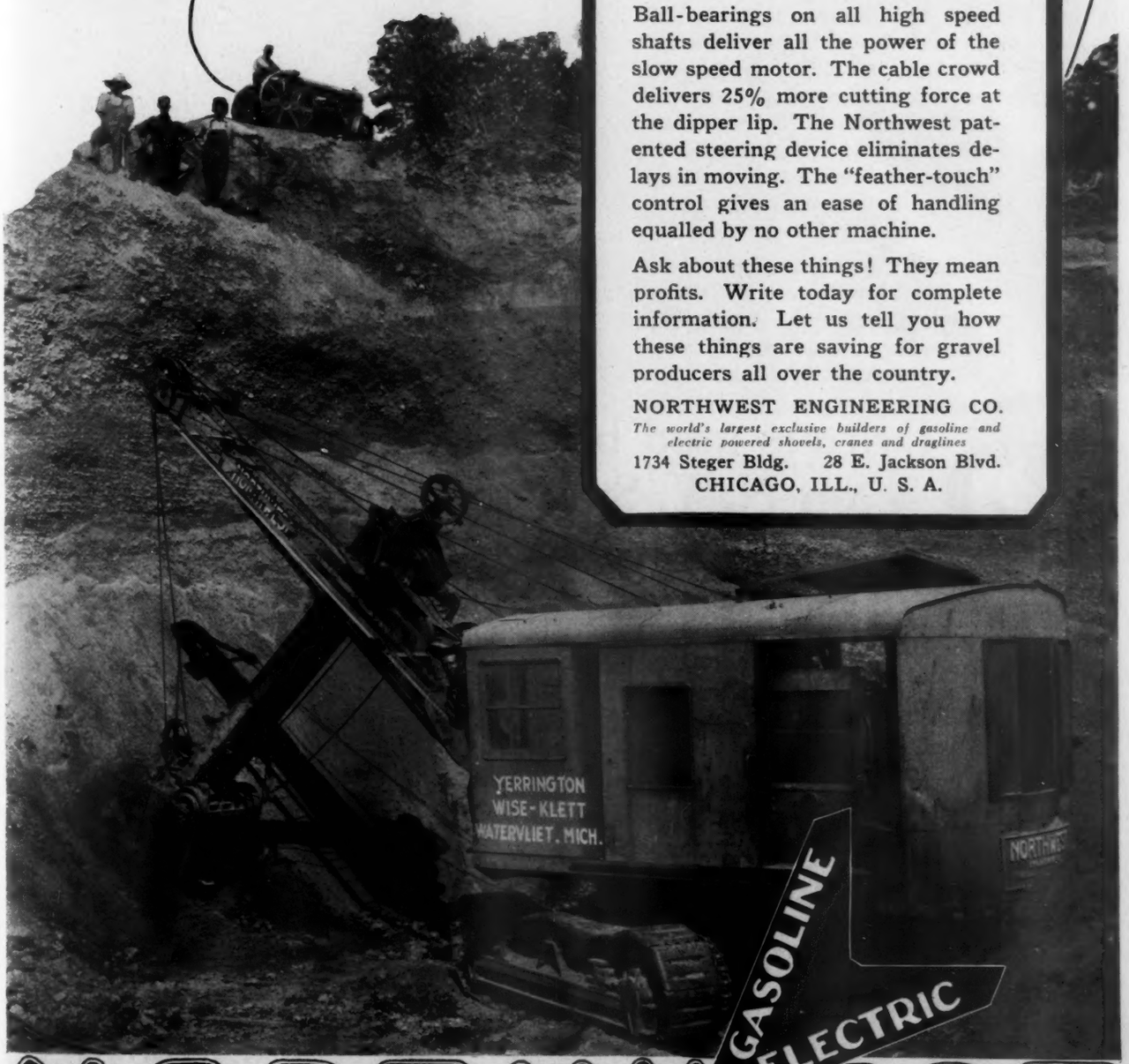

NORTHWEST

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CP-5 Drifters turning off tunnel heading from Welfare (formerly Blackwell's) Island shaft

CP Drifters used by Patrick McGovern, Inc. on N. Y. Subway Contracts

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Over 100 CP Drills have been purchased to date.

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This remarkably small amount of power is able to produce **large capacity**—because no power is lost through friction, or dissipated in the shaking of the screen supports.

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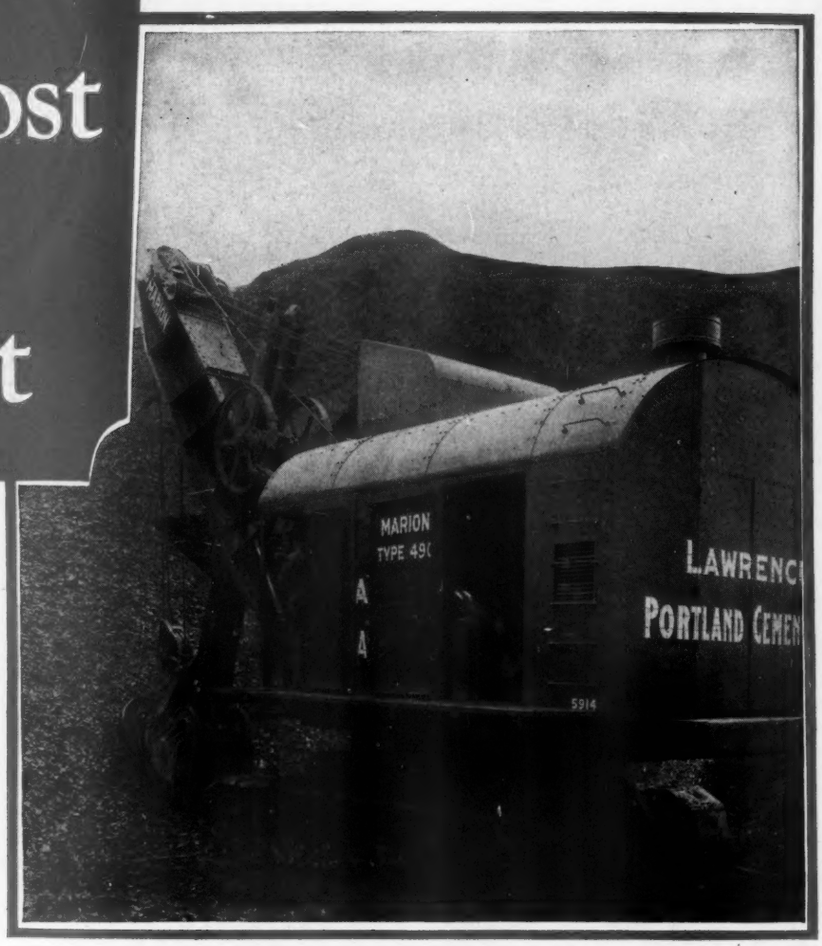

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AT the lowest price ever established for a heavy duty shovel; with speed and power to equal production of larger machines; designed simply for absolute one-man control (even steering from the cab); with Ward-Leonard Control and many other outstanding Marion refinements, the Type 490, 2¼ yard electric shovel is outselling any shovel today in the stone, lime, cement and ore industries—bar none. Mail the coupon for Bulletin.

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Here's why: 1. Two flat revolving discs (patented) edge into and under the pile—making sure that each up-coming bucket is filled brimming to the top.

2. The floating boom (patented) rides rough ground—keeping strains and twists away from the loader itself. Wear and tear is slight.

See how others have learned the low down on low loading costs. Ask for our book "Loading Layouts."

THE LOW DOWN ON LOW COSTS

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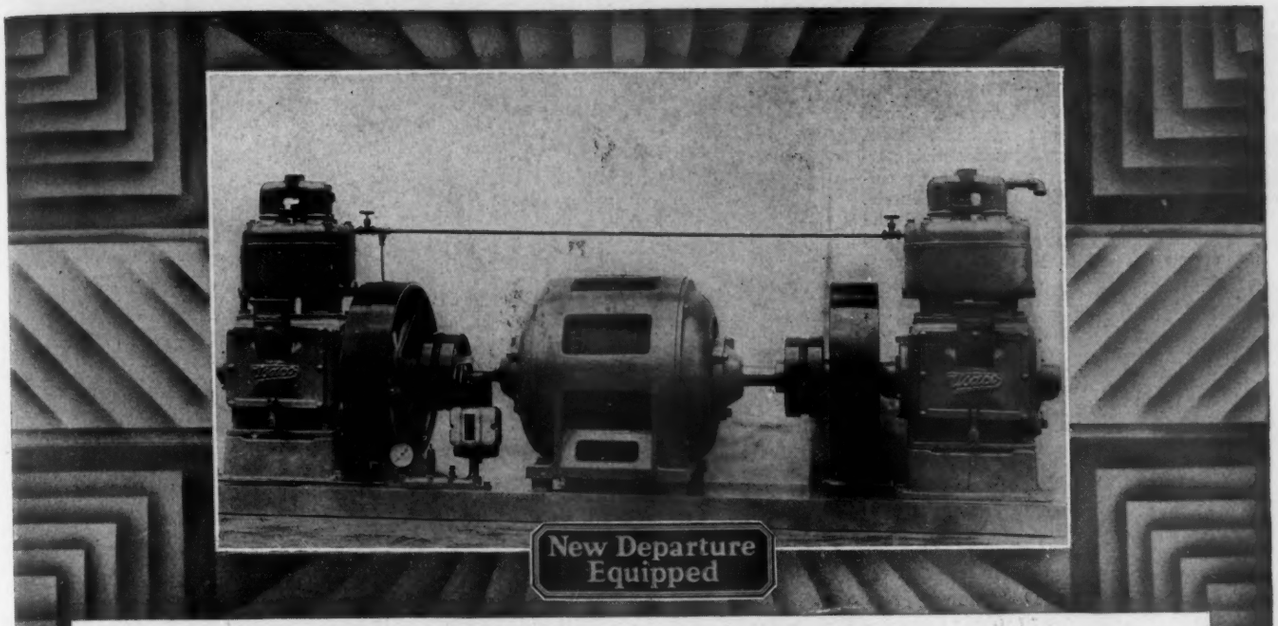
Model "25"—1 yard per minute

Model "42"—1¼ yards per minute

Model "28"—wheel mounted



A *breakdown means* . . . . . .

men and machines idle, lost time and upset production schedules, while repair costs take the place of profits.

Bearing trouble is the cause of most breakdowns—but bearing troubles stop automatically when the machines you buy or build are provided with New Departure Ball Bearings. The wear of friction is eliminated, thrust and radial loads are successfully resisted and lubrication troubles are done away with.

Further, New Departures can be effectively protected against the destructive dust and dirt of the rock products industry.

U. S. motors are equipped with New Departure Ball Bearings for it is proven that New Departures make electric motors more dependable and keep them everlastingly at work without stops due to bearing troubles.

Write for engineering data sheets. Sent on request.

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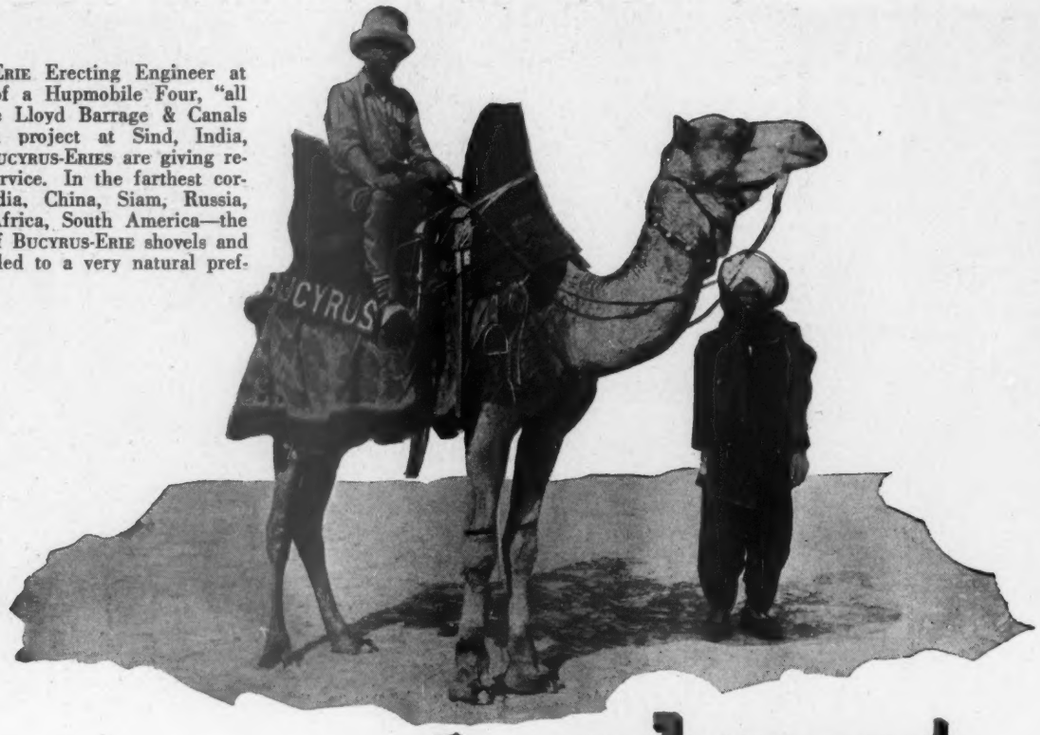
New Departure Quality Ball Bearings

Whenever you have a bearing problem our expert engineers will be glad to discuss it with you personally. We will help you to do your thinking.



BUCYRUS-ERIE Erecting Engineer at the wheel of a Hupmobile Four, "all set" for the Lloyd Barrage & Canals Construction project at Sind, India, where 35 BUCYRUS-ERIES are giving remarkable service. In the farthest corners of India, China, Siam, Russia, Australia, Africa, South America—the *reliability* of BUCYRUS-ERIE shovels and cranes has led to a very natural preference.

Does your shovel meet the "Camel-back" test?

Maybe you have never worked a shovel at the far side of a desert—where any repair parts would have to be carried "camel-back." If you did, you'd certainly be careful to pick a reliable shovel for that job!

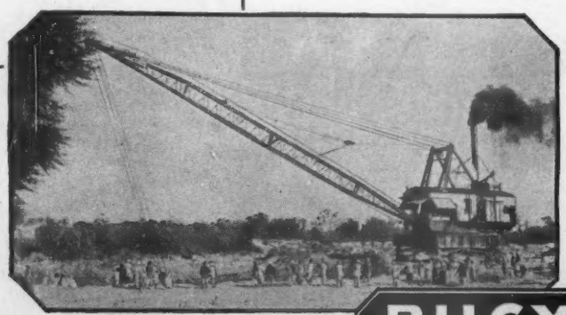
But why not choose just as carefully for *every* shovel job? Even if your work is right smack up alongside of a railroad, extra repairs mean added cost—and what's far more expensive than the parts, *lost time.*

In any location, the shovel or crane you can depend on to Stand Up and Produce is the profitable machine to use.

Which explains why BUCYRUS-ERIE shovels and cranes are leaders in the far-away places, as well as throughout the U. S. A.

A Union of Strength

"BUCYRUS" and "ERIE"—each the most successful manufacturer in its particular field—consolidated Jan. 1, 1928. The unmatched resources of BUCYRUS-ERIE assure the buyer of Unequalled Value, More Efficient Machines, Permanence of the Manufacturer, and a More Complete Field Service.



These machines are built with *Reliability* as the first consideration. Simple design, extra rugged construction, with plenty of the right steels where extra strength counts most—assuring you a machine that does a bigger day's work and *gets the work done.*

BUCYRUS-ERIE COMPANY

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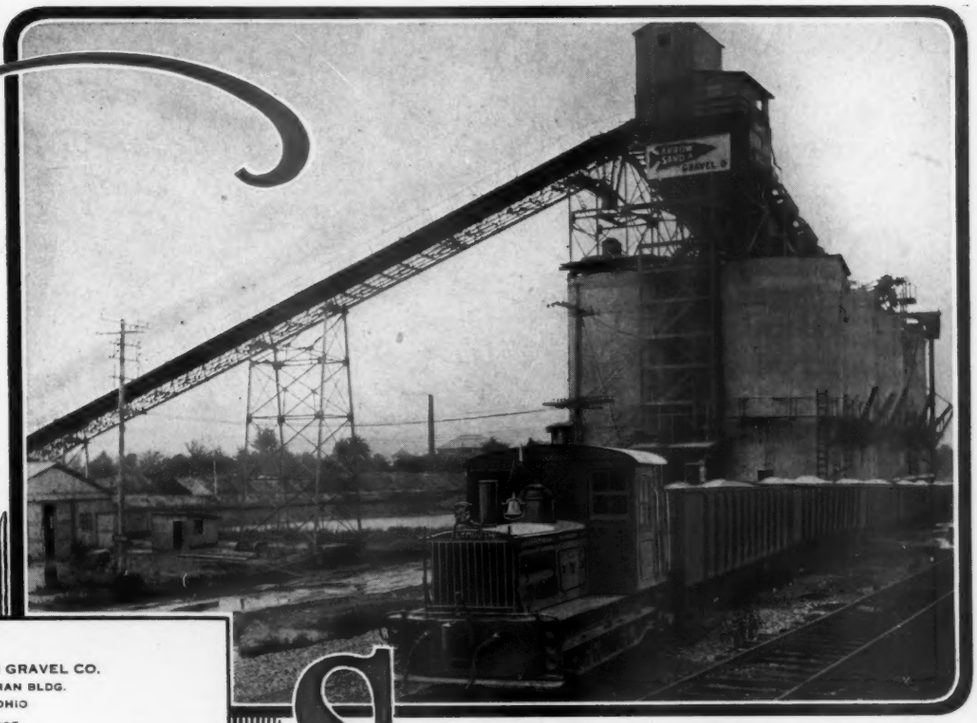


PLYMOUTH LOCOMOTIVES

THE ARROW SAND & GRAVEL CO.
OFFICE 900 HARTMAN BLDG.
COLUMBUS, OHIO

July 26, 1927

The Fate-Root-Heath Co.
Plymouth, Ohio.

Gentlemen:

Our Plymouth 20-ton Gasoline Locomotive has now been in service for the past fifteen months. It is used in loading cars at the Tipple and switching the loaded cars to the railroad track.

We have one track which is about a mile long which connects our plant loading track with the T. & O. C. R. R. This track has grades varying from nothing to 4 per cent. These grades are short, some are in favor of the loads and some in favor of the empty cars, which arrangement is only to suit our local conditions. Gross weight of loaded cars is about 150,000 lbs. each.

We have also occasionally substituted the Plymouth for one of our steam locomotives in transporting the loaded gravel cars from the gravel excavator to the crushing plant. The tracks are very rough, and we have a grade of 3 per cent about 800 ft. long. On this grade we have no trouble in handling a standard 50-ton hopper car loaded full with pit run sand and gravel. We operate the Plymouth over curves that are so sharp that it is even with difficulty we can get a standard railroad car around them.

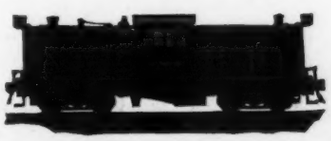
I am glad to report the Plymouth has proven very satisfactory to us for our work.

Yours truly,

J. L. Marsters

Plant Manager

If it's a Track Haulage Problem
There's a PLYMOUTH to Solve it



50 ton Diesel

Plymouth Diesel Locomotives are built in a full range of sizes from 10 to 50 tons. Designed to reduce fuel and operating costs to a minimum.

Write for descriptive literature and illustrations showing the wide adaptability of Plymouths to Haulage Problems.

Satisfied after a 15 Month Test

TIME is the ultimate test.

What a haulage unit will do after one—two—three—even ten years of service is the mark of its real worth.

Although a Plymouth locomotive is similar to a heavy automobile mechanically, its value does not depreciate in proportion because styles and models do not enter into the problem. The way it does the job you bought it for and keeps on doing it without interruption sets its value. Economy is evidenced year after year, not only in its fuel consumption but by its "ever-readiness" to go and do the same work it did when it was "young."

That's why a Plymouth soon pays for itself.

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
PLYMOUTH, OHIO

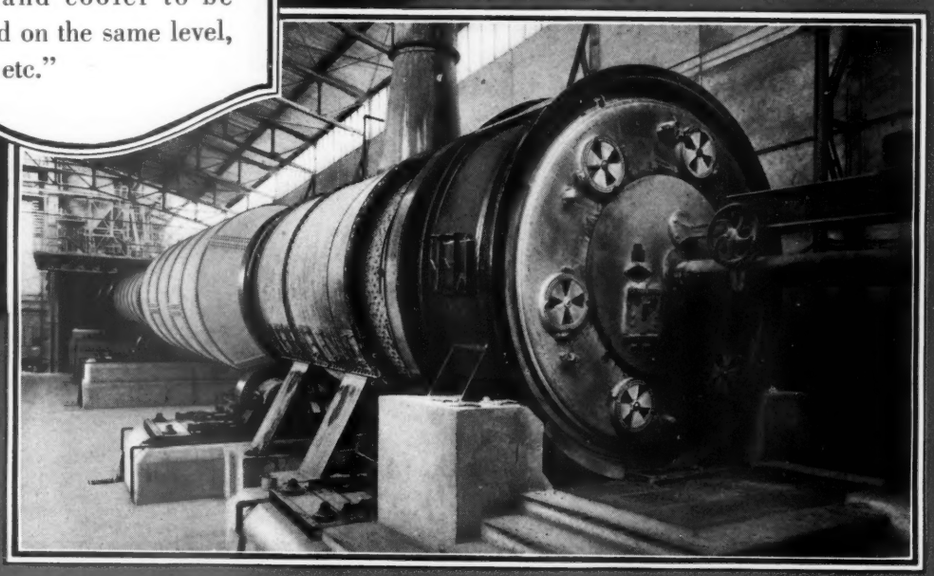
PLYMOUTH
GASOLINE *Locomotives* DIESEL

POLYSIUS

SOLO KILNS

From Rock Products, December 24, 1927

"The name 'Solo' has been given to this kiln because it does in one operation what usually requires two. The cooler is attached to the burning drum which allows both kiln and cooler to be placed on the same level, . . . etc."



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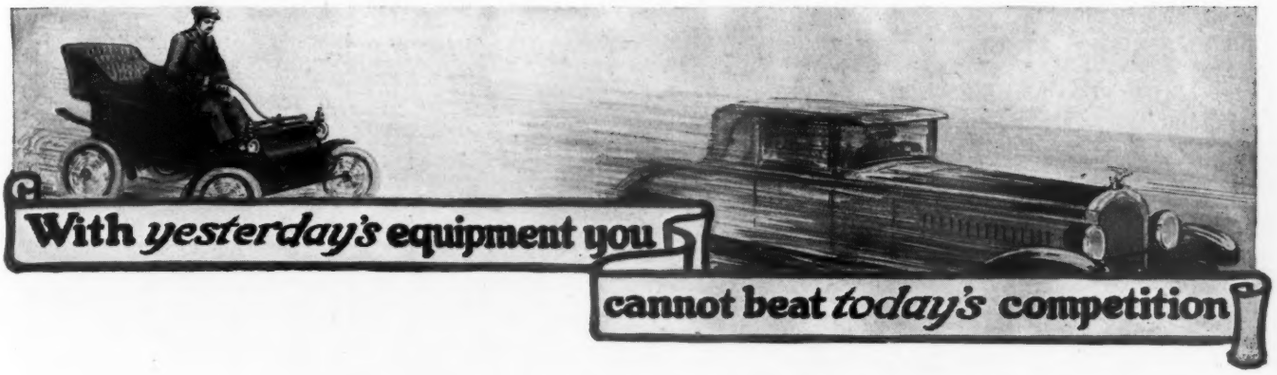

**** * * obsolescence of plant constitutes a major obstacle to the further advancement of American industry. * * * antiquated equipment, a heritage of pre-war days, is still cluttering up all too many shops.***

—From statement of Dr. Julius Klein of the Bureau of Foreign and Domestic Commerce

Modern machinery is vital to the process industries in the present period of readjustment.

The past ten years have been marked by a relentless recession of prices, particularly in basic products—and a consequent pinching of profits all along the line. Greater production efficiency now offers the only means of relief.

Where firms have survived price cutting, they have done so through the adoption of better methods and more advanced types of machines.

Attempts to meet lower prices without reducing costs lead to eventual business extinction. Manufacturers who cling to old ways and old equipment become martyrs to small profits.

A producer of powdered materials can no longer grind his product on burr stones, screen it through bolting cloth and re-handle it to the bins—and expect to compete with the progressive manufacturer who processes his product in one continuous operation from pulverizer to collector, by means of Air-separation, Air-drying and Air-conveying.

In the fine grinding of materials, you need equipment that keeps well ahead of the field in the race for lower costs and larger profits.

The Raymond KILN-MILL

is an advanced development in pulverizing machinery that enables you to easily outstrip competition in quantity of output, quality of output and cost of output.

It dries as it grinds, dispensing with the customary pre-drying apparatus.

In pulverizing delicate materials, ***drying-in-the-mill*** prevents spoilage due to discoloration or scorching, such as might happen in methods where heat is applied directly.

The hot gases, supplied to the KILN-MILL mix with the air used for separation. The result is a mildly tempered, rarefied and "thirsty" atmosphere that quickly absorbs moisture from the flying particles. The vapor-laden air is automatically ejected from the system, and the dry powder delivered through dust-tight piping to the cyclone collector, without elevators or conveyors.

The merits of the KILN-MILL and its adaptability to your plant and product are points that will bear your careful consideration. Its increased capacity due to "dry grinding" may be a means of revolutionizing your production schedules.

If you already operate a standard Raymond mill or pulverizer, our engineers will be glad to tell you how your installation can be redesigned, so as to incorporate the ***drying-in-the-mill*** feature.

Whether your plant is Raymond equipped or not, if you want specific information on ways of improving your methods and product, please feel free to consult us regarding your problems.

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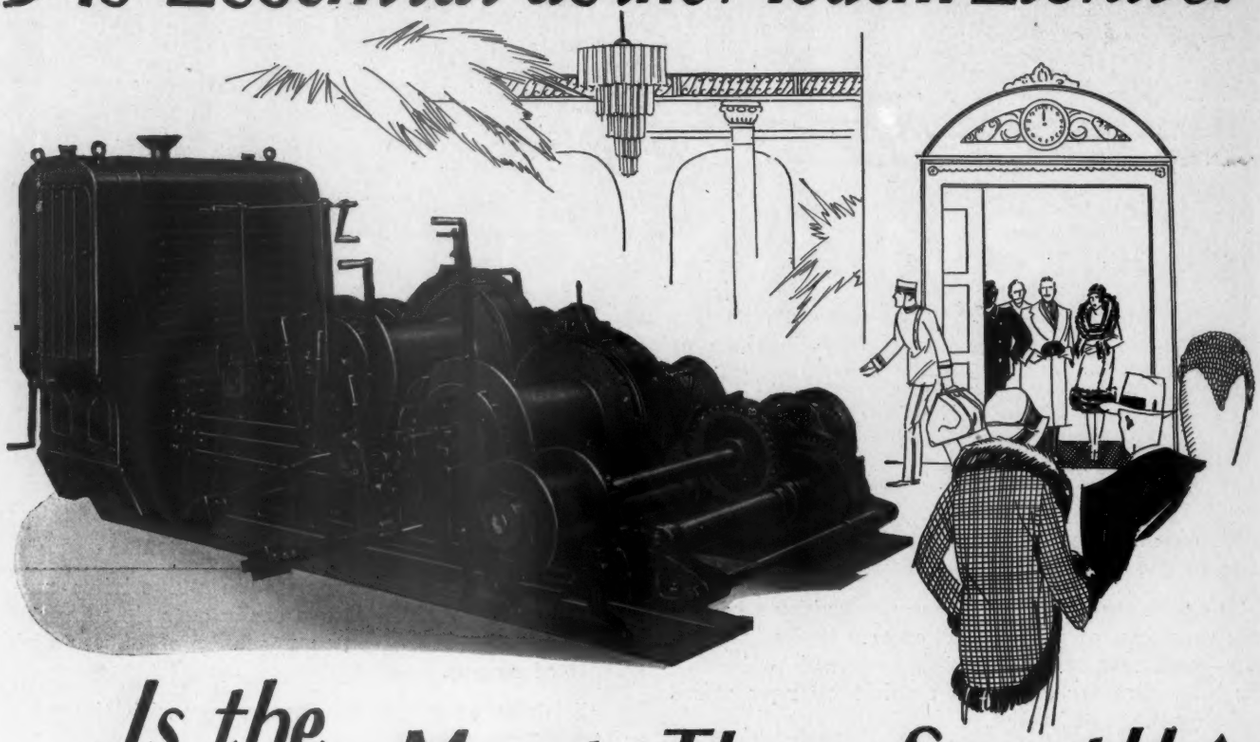

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If the load is heavy, the speed of the freight elevator will suffice. But when running light a lot of time and money can be saved by speeding up. And that's just where the Mundy Hoist rules supreme — because it has three speeds — a different speed and a different line pull just suited to the weight of the load.

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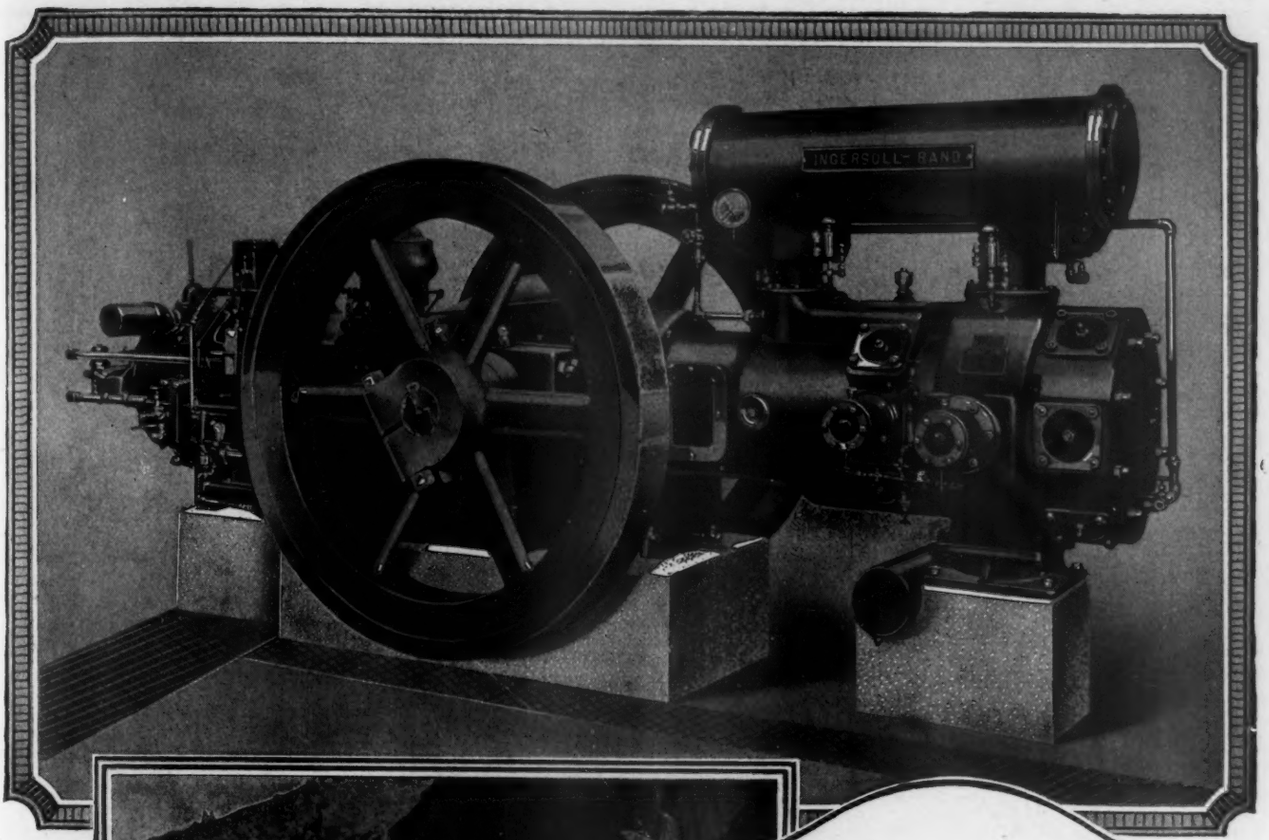

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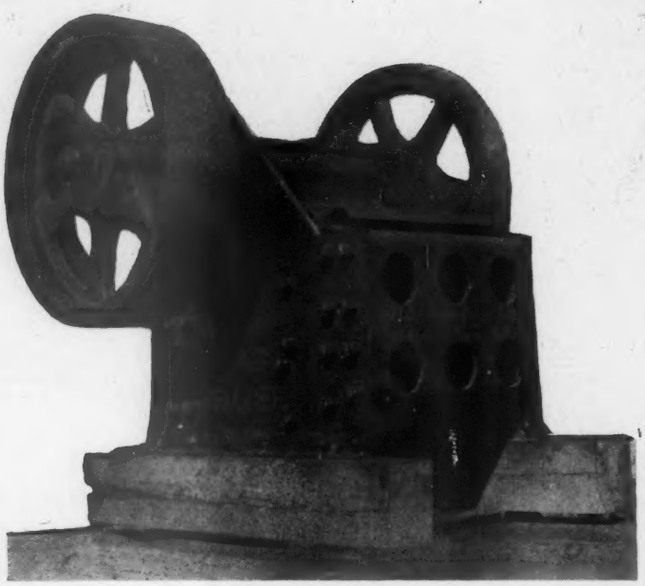

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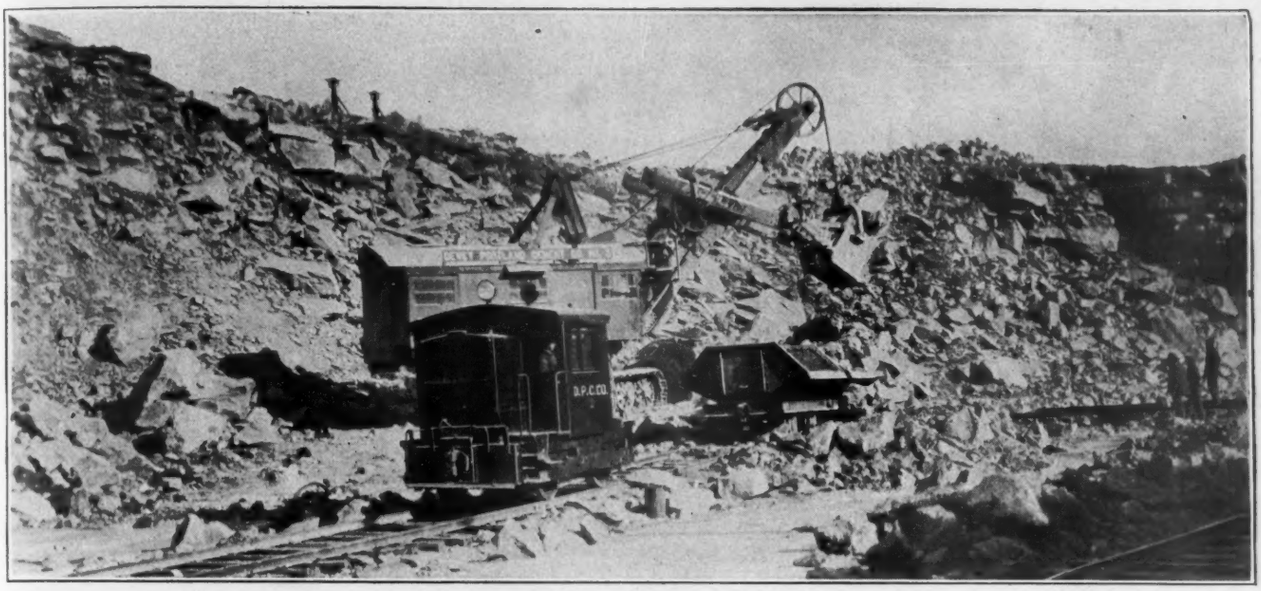

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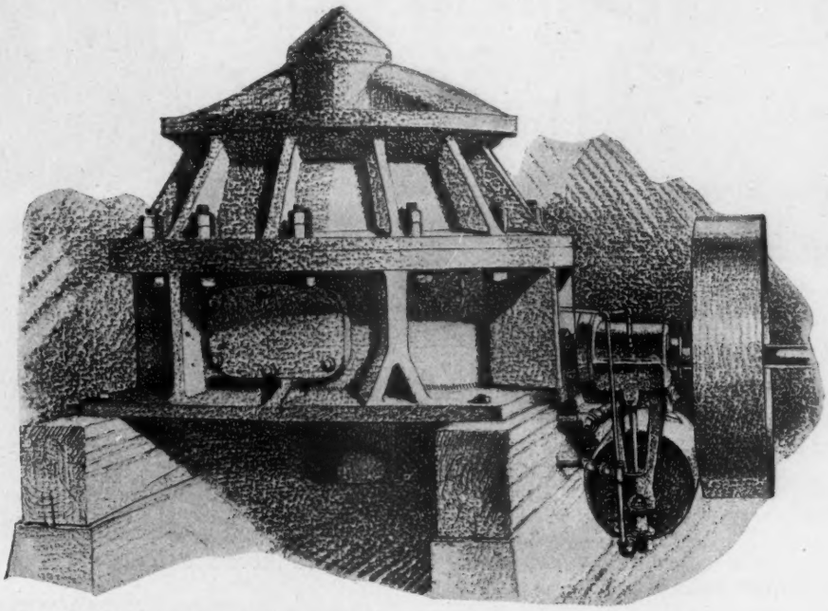

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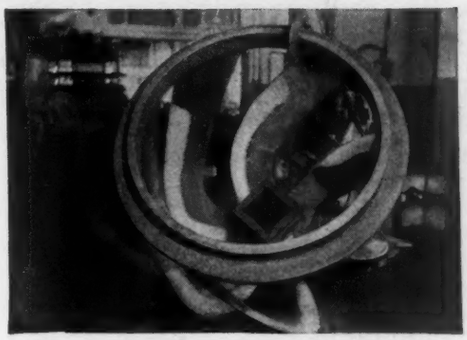

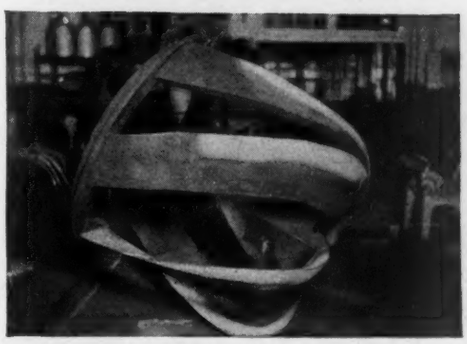

This casting is 4′ high and 4′ long with six cutter blades 12″ wide. Notice the layer of Stellite along each side and on the inside and outside surfaces of the blades.

TEN months' dredging before it was pulled for repairs! Yet the cutter it supplanted wore out in six weeks after dredging only 80,000 cu. yds. of material.

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are characteristic of these Reducers

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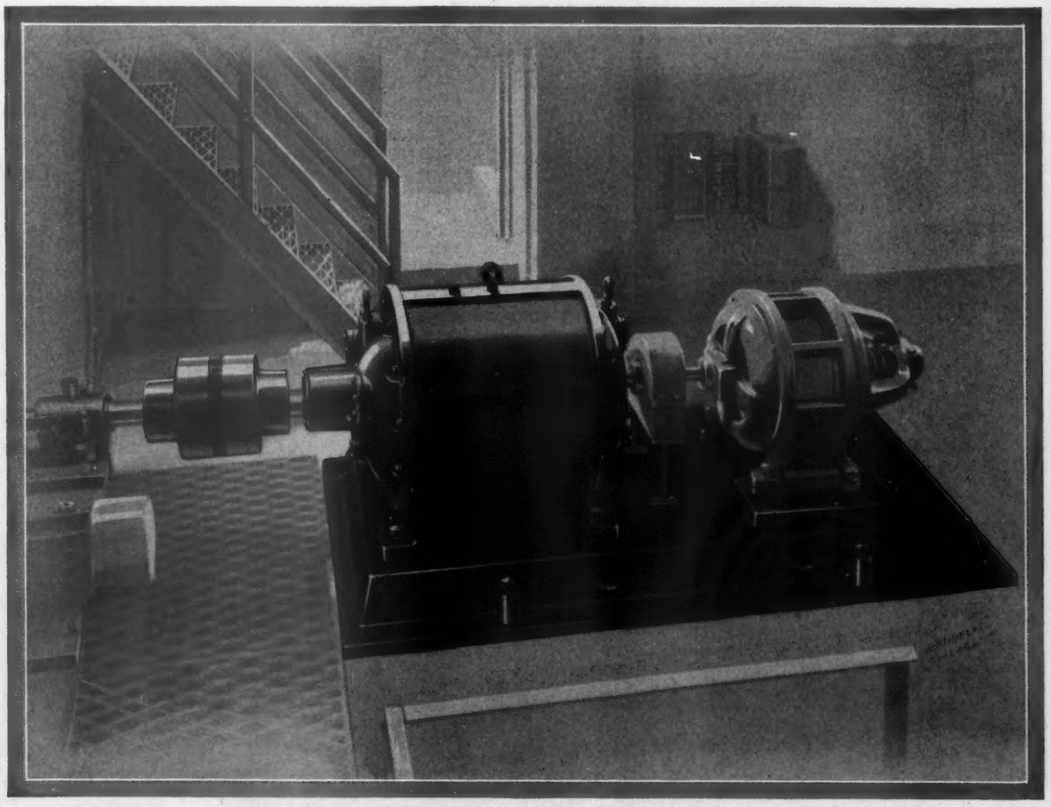

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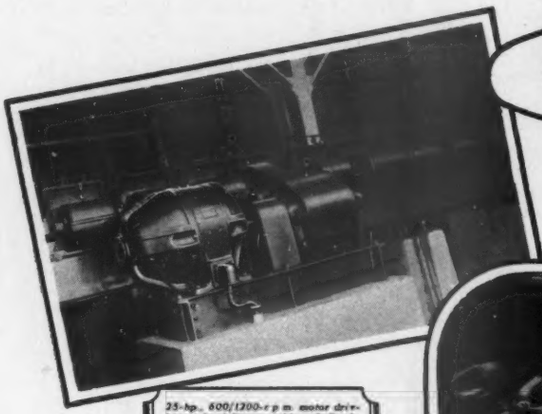
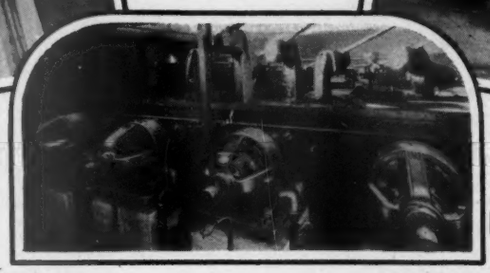


35-hp., 600/1200-r.p.m. motor driving tube-delivery table. J & L. Seamless Tube Mill



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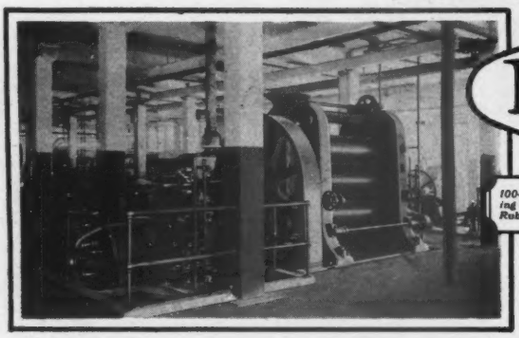

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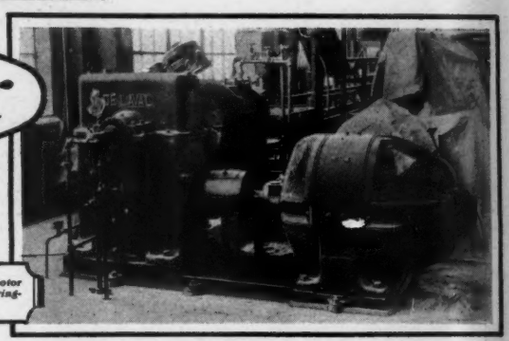

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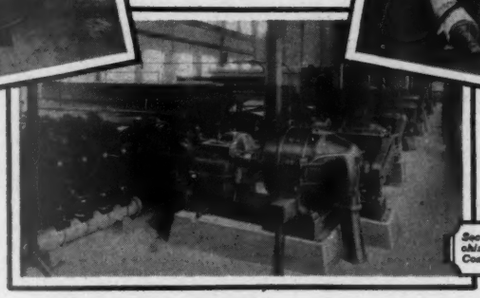

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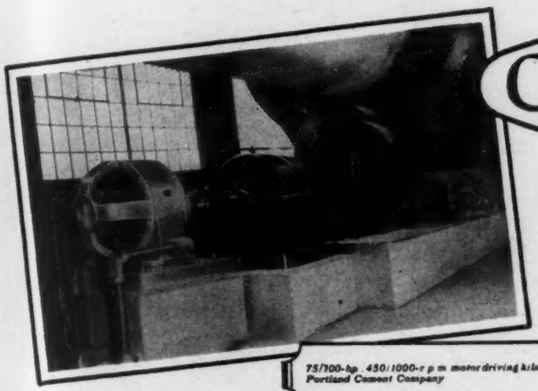

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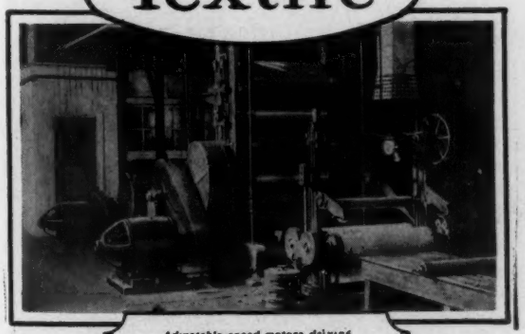

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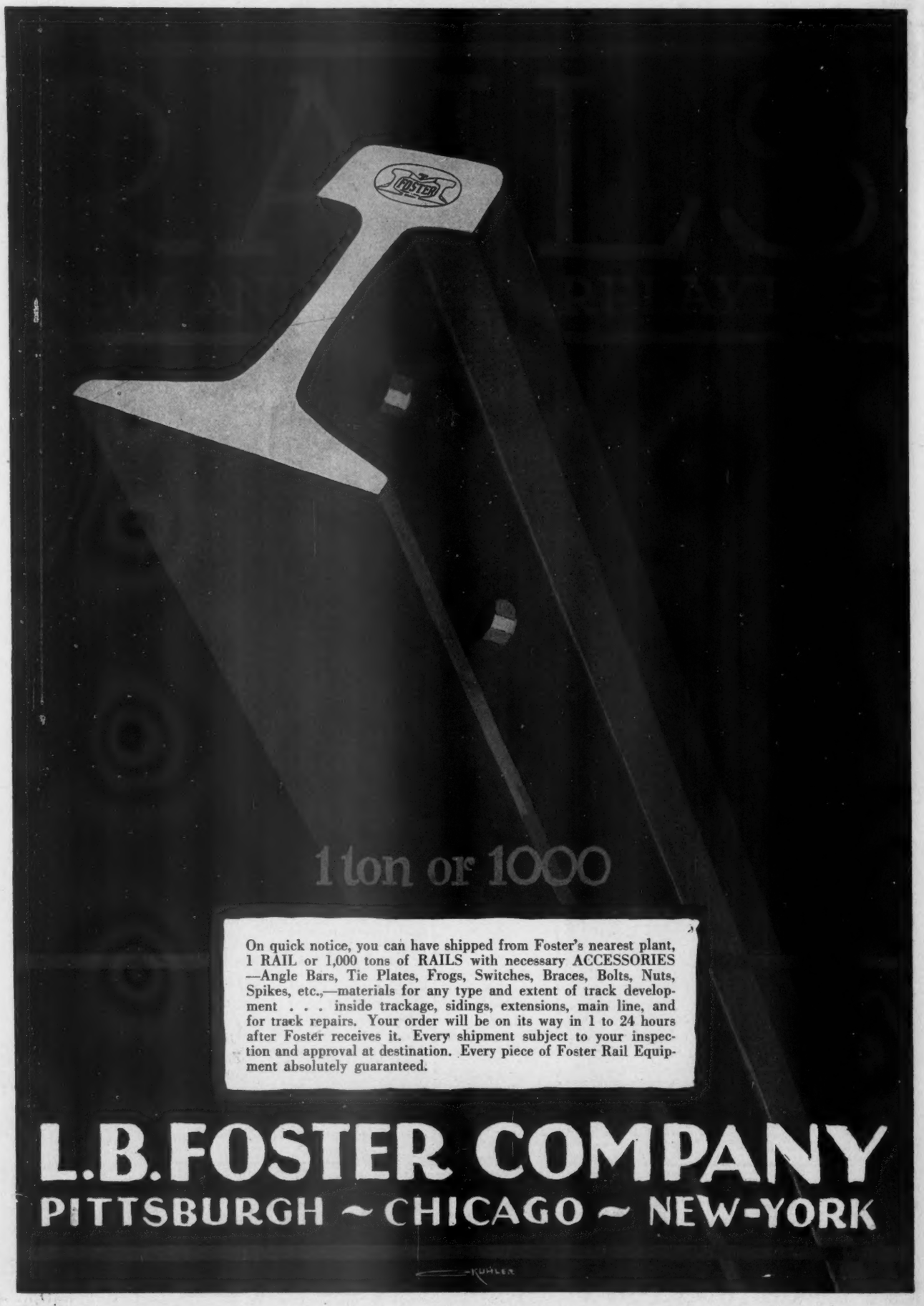
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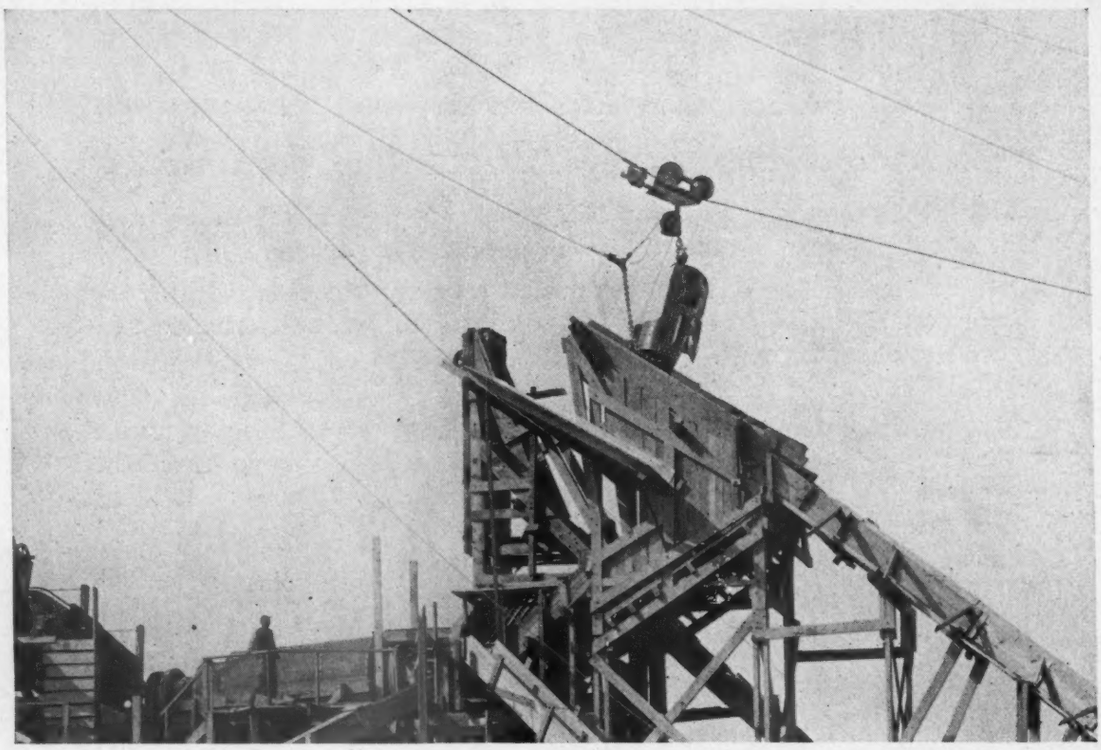

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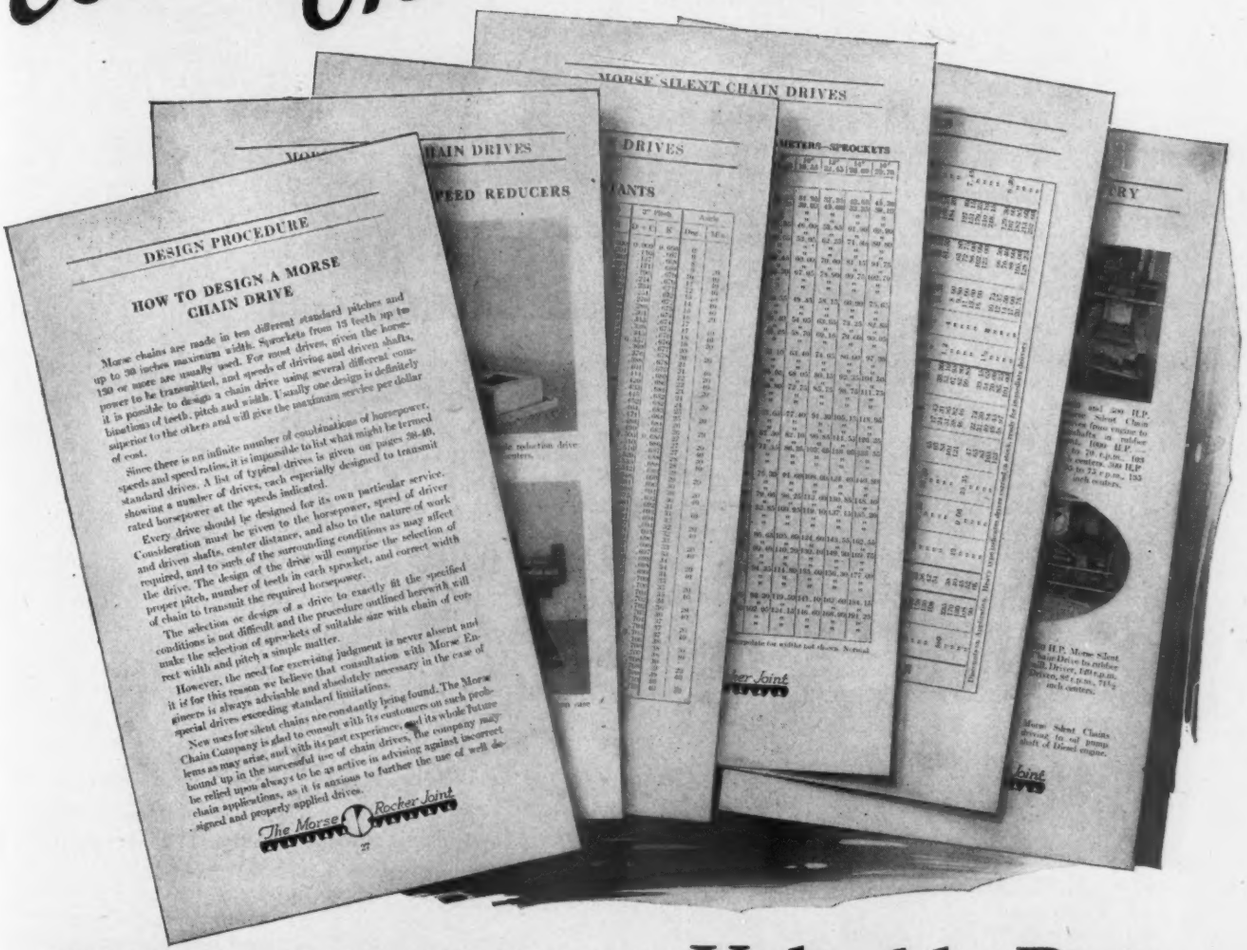

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When the traveling is tough and there is a lot of soft clay or mud underneath your shovel, then you appreciate the tremendous power behind the low and high speed DC crawlers. The use of mats is rarely needed because of the broad twenty-four inch crawler belts and each belt has an independent drive for steering in any direction desired.

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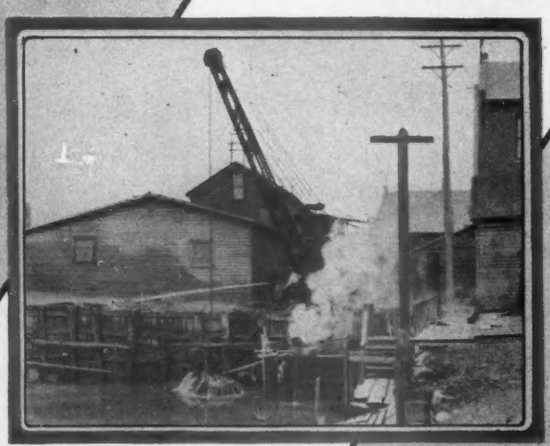
TWO SPEED HOIST



Extra power on the hoist line is often just as necessary as it is on the crawlers. For light grading and similar work the high speed hoist on the DC gives fast operation and big output, but when you want power just shift into low speed.

This low speed is particularly useful where the going is heavy and a single speed machine can't get the work out. The DC is built in dipper capacities of from ⅞ to 1¼ yards. Other Industrial Brownhoists have ½, ⅝ and ¾ yard dippers.

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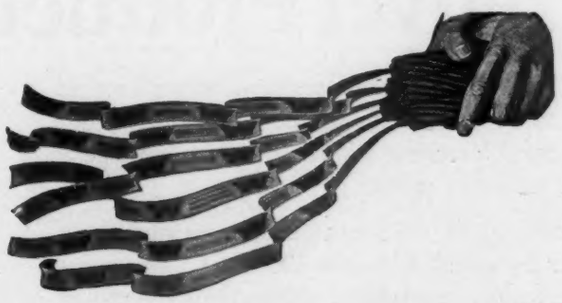

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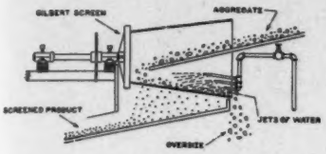
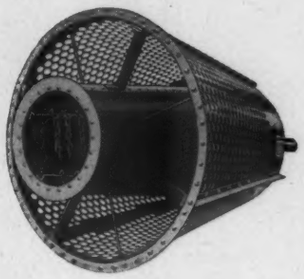


S-A Gilbert Screens

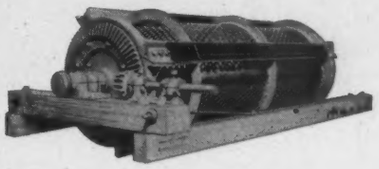
Gilbert Screens wash the sand and gravel as they screen. The large end is entirely open and the inside is free from obstructions which might retard screening action. Aggregate is delivered to the closed end and is tumbled toward the open end against jets of water. All oversize discharged at open end has passed over screen openings and has been washed clean.

Made in sizes from 48 to 84 inches in diameter.



S-A Columbia Scrubber

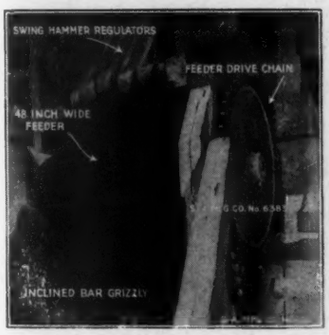
This is a combination scrubber and screen. A water-tight steel scrubbing barrel is mounted inside the standard 84-in. Gilbert Screen. Heavy chains fastened to the inside of the barrel agitate the material and loosen the dirt. Steel vanes discharge the aggregate into the Gilbert Screen where the final washing and separating is done. Screen perforations can be furnished for any sized product desired.



S-A Cylindrical Screens

Screens furnished by S-A are built to give long service life. The frames are rigid, screen barrels are strongly tied and braced and special provision is made to facilitate the replacement of screen plates. Screens can be furnished with blank scrubbing sections, with or without dust jackets and with perforations to give any desired separation.

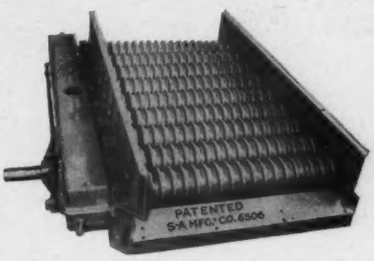
Lengths up to 30 ft. or over can be furnished.



S-A Swing Hammer Regulator

Large openings prevent material from bridging in loading hoppers. In such openings the Swing Hammer Regulator is recommended to keep material in check. The heavy hammers hang in front of the opening above the feeder and limit the flow of material. Whenever a large lump appears one or more of the hammers raise enough to pass the lump and return to position.

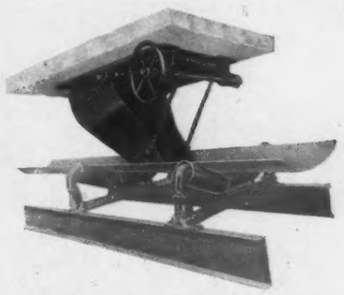
Hammer Regulators are designed in different weights and widths to meet any condition.



S-A Live Roll Grizzly

This grizzly will not clog. The cross shafts carry grooved spools which match to form round openings gauged to pass the desired size product. Each successive spool rotates at an increased speed to spread load and eliminate clogging. The material is gently agitated and turned as it passes in waves over the spools. The drive mechanism is enclosed and automatically lubricated.

Made in widths from 24 to 60 inches.



Gate and Loading Chute

This combination gate and loading chute was designed for use in loading belt conveyors in tunnels under storage piles. The hinged chute is self-cleaning and when lowered permits the material to flow onto the belt. An auxiliary rack and pinion slide is provided to regulate the size of opening. Raising the chute cuts off the flow of material.

Made in sizes to load 24 in. and 30 in. wide belts.

If you are contemplating a new washing, screening or crushing plant or planning new equipment for your present plant, write our nearest office. S-A Engineers have designed and built successful plants in all parts of the country and will be glad to make suggestions or help with preliminary layouts.

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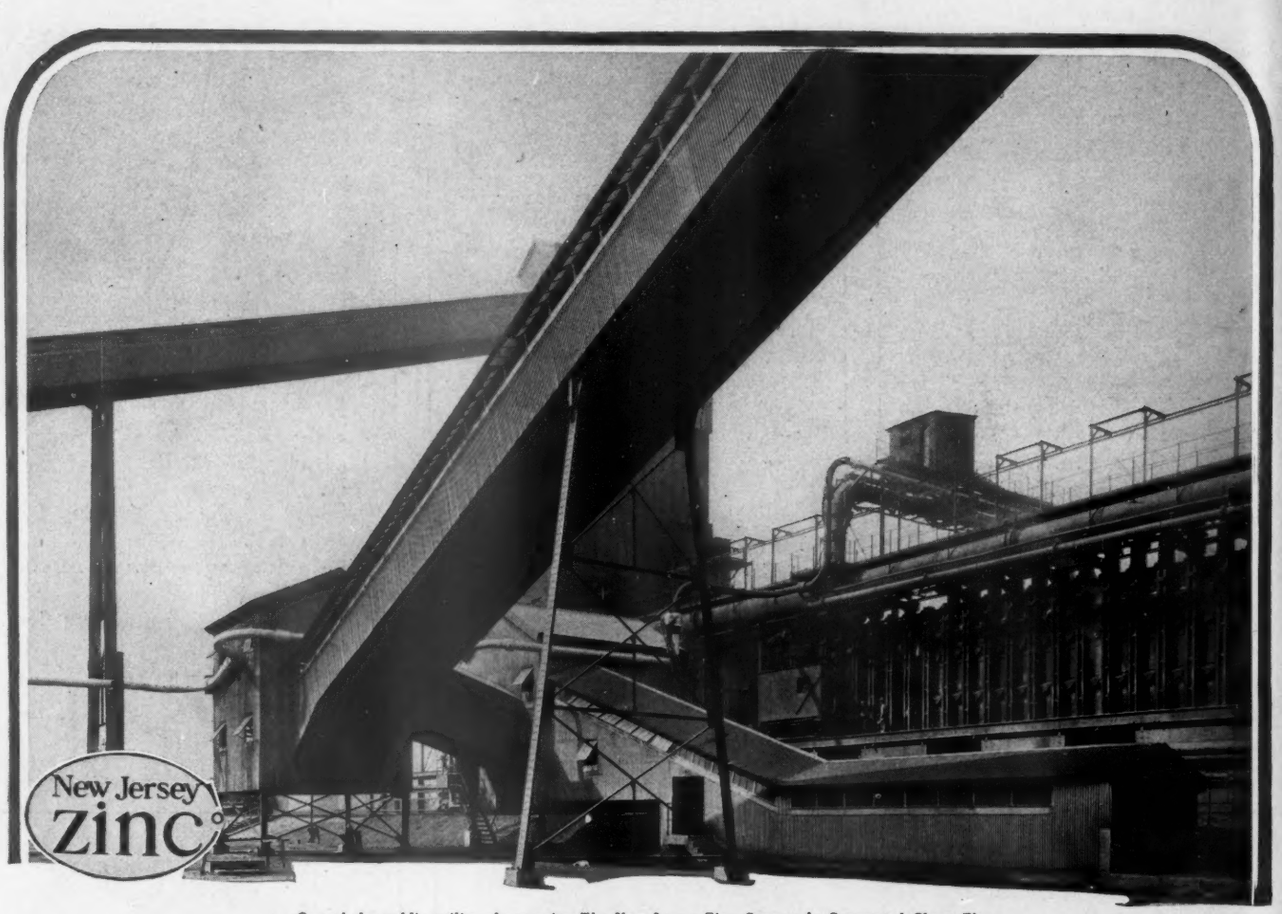

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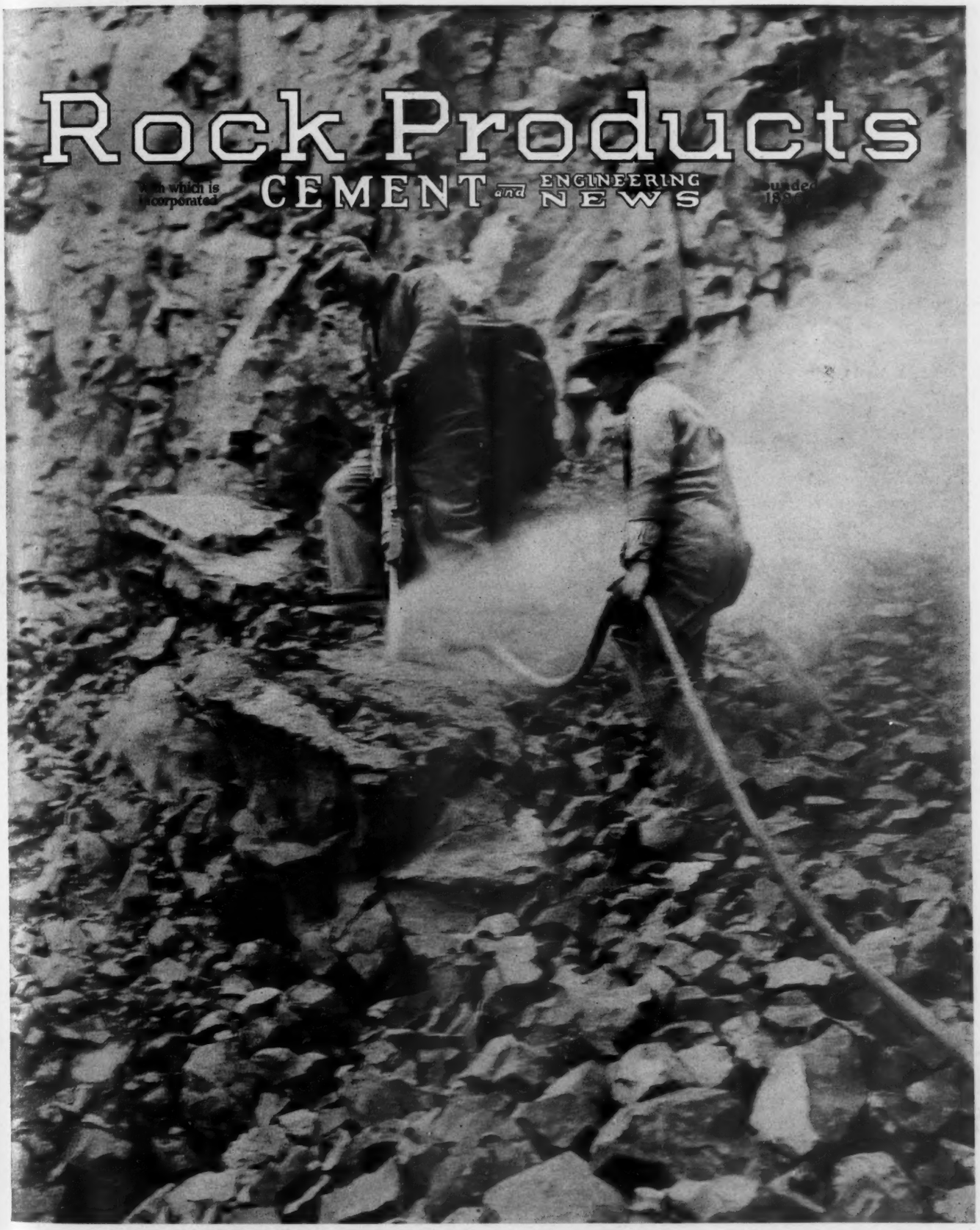


Block-hole drilling at the Samuel Braen and Sons quarry at Hawthorne, N. J.

Flexible Hillside Crushing Plant

Samuel Braen and Sons, Hawthorne, N. J., Now Operating Rebuilt Elevatorless Plant—Storage Bins Between Scalping Screen and Secondary Crushers—Motor Trucks Used in Quarry and for All Deliveries

By George M. Earnshaw

SAMUEL BRAEN AND SONS have been in the crushed stone business for more than 20 years. First, Samuel Braen himself had a small plant in Paterson, N. J. But as his requirements grew larger, he and his two sons, John and Abraham, decided to build a larger plant. They first built, on the site of their present plant, about 12 years ago and since that time have added to and rebuilt until now they have a plant capable of producing 1500 tons of crushed trap rock a day. This plant is located on the outskirts of Hawthorne, a suburb of Paterson, N. J.

Hillside crushing plant of Samuel Braen and Sons, Hawthorne, N. J.

It is more of a mountain-side than a hillside operation, for although the plant occupies a goodly portion of the hill, it is still a considerable distance to the bottom. In designing the plant every advantage was taken of the hillside so that under the present layout not a single elevator is used in the entire operation.

The Quarry

The quarry floor is about 6 ft. above the hopper of the primary crusher and is perfectly level, making it ideal for the operation of motor trucks. The face of the quarry averages from 75 to 80 ft. in height and its working length at the present time is about 500 ft. A Keystone well-drill, electrically powered, is responsible for all the major drilling. The holes are 7-in. in diameter and of varying depths. The secondary drilling is done by the usual jackhammer type drills. At the time of the writer's visit the following drills were on the job: two Chicago Pneumatic CPIO'S; one Ingersoll-Rand, BC-4; one Wood; Cleveland, two D-5's and one H17. A Sullivan drill sharpener and a Champion electric forge are used to keep the drills in proper condition. Air for the entire operation is furnished by a 12x10-NSB Chicago Pneumatic Tool Co. simplate valve compressor, driven by a 50-hp. General Electric motor.

Stone loading is done by one shovel, a Marion 37, full electric, mounted on crawlers. The haul from the quarry face to the crusher house is a comparatively short one and two 7½-ton motor trucks, a Mack and a Pierce-Arrow, easily keep the crusher constantly supplied with stone.

Crushing and Screening

The primary crusher is a 36x48 Farrell jaw and is belt-driven by a 200-hp. Westinghouse motor. This crusher is mounted in a separate building, about 120 ft. distant from the rest of the plant and at right angles to it. A 30-in. belt conveyor of 125-ft. centers takes the crusher's entire output to the scalping screen.

The most unusual feature of the plant may be found at the scalping screen. It is a 60 in. by 12 ft. Farrel screen, belt driven from a counter shaft by the 30-hp. Westinghouse

A part of the quarry showing the level floor

Putting in a snake-hole

Electric shovel loading to motor trucks

Top at left, storage bins between scalping screen and secondary crusher (center). The tailings crusher shows at right, bottom

motor which also drives the conveyor. The screen is mounted over a 16-ft. square bin and its discharge end is directly over a similar bin mounted almost directly over and behind the secondary crusher. There are no chutes whatever, the stone dropping directly into bins. Storage bins between the secondary crushers and the primary screening unit are a rather uncommon arrangement and at this plant this feature permits either "end" of the plant to operate independently of the other, for each bin is of sufficient capacity (150 tons) to keep either end operating for a reasonable time during a shutdown in the other end. That is, if something should break down in the quarry or at the primary crusher, the secondary crushers and sizing screens could keep on operating, at least until these two bins were emptied; if something should happen to the secondary crushers or sizing screens, the quarry and primary crusher could continue to operate at least until the two bins became full.

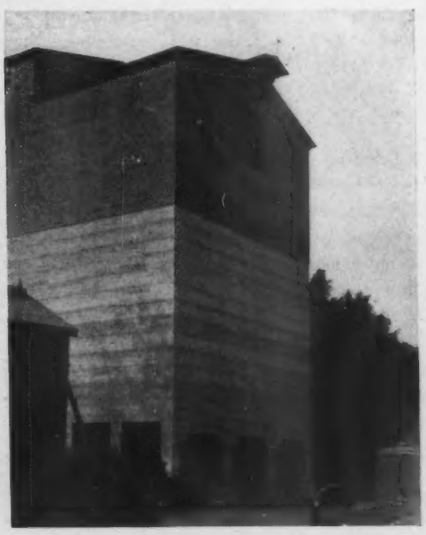
Main conveyor handling material from all the crushers

The secondary crusher is an 18x36 Farrel jaw and stone is fed to it by gravity from the rejections bin described above. The contents of the other bin (product of the scalping screen) flows by gravity directly to the main conveyor leading to the sizing screens.

The output of the 18x36 crusher moves by gravity to a 48-in. Kennedy rotary screen, 12-ft. long, fitted with screen sections of 2-in. perforations, similar to those of the scalper. Stone passing through the 2-in. rings goes to the main conveyor while the rejections are sent, by gravity again, and through a split feed, to two final reduction Farrel jaw crushers, one a 10x20 and the other a 10x36. Both of these crushers are driven by one 125-hp. General Electric motor.

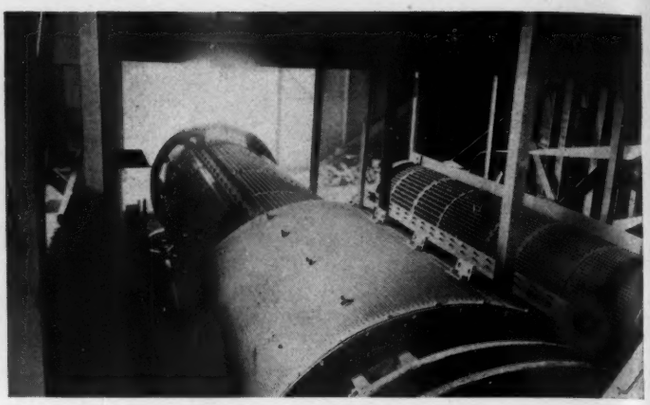
The product of the 10x36 crusher is chuted to the main conveyor and the product of the 10x20 jaw is handled by two short conveyors, back to the screen which takes the output of the first secondary crusher. These two short conveyors, the 18x36 crusher and the 48 in. by 12 ft. screen are all driven by one 125-hp. General Electric motor.

The main conveyor does a real heavy duty,



Screening plant and storage bin

Air compressor supplying air for all the drills



Sizing screens in the screening plant

Main part of the plant from the screening room over the bins. The conveyor gallery in the background runs to the primary crusher

One of the 7 1/2-ton motor trucks dumping to the 36 x 48 primary crusher This crusher is about 120 ft. from the rest of the plant

receiving its load from three different sources. It is a 30-in. rubber belt of 330-ft. centers, and it is estimated that it carries an average of 150 tons per hour. It discharges into two sizing screens, one of which, a Farrel, is 60 in. in diameter; the other, a Kennedy, 48 in. in diameter. Both screens are 27 ft. long. The larger one is driven by a 30-hp. motor and the smaller one and the main conveyor by another 30-hp. motor, both of which were furnished by the General Electric Co.

Loading and Storage

The storage and truck-loading bins are the most recent addition to the plant. There are 18 of them, all of reinforced concrete construction, each having a capacity of 150 yd. There are three bins for each of the six sizes which the plant now produces. These sizes are: "Dust," ⅜-in., ¾-in., 1-in., 1½-in. and 2-in. The plant's entire output is delivered by motor trucks, some of which the company owns and others which it hires. The company's fleet, in addition to those trucks in the quarry, consists of two 5-yd. Pierce-Arrows, two 2-yd. Graham Brothers, and a 2½-yd. Schacht. In all, including those owned by the company's customers, there are more than 20 trucks hauling stone from the plant daily. All stone in this locality is sold by the yard instead of by the ton.

Truck loading arrangement under the bins

The economy of operation is quite apparent in summing up some of the essential features in the design of the plant. This is particularly true of the quarry hauling, where only two motor trucks are sufficient to carry the entire production of 1500 tons per day to the primary crusher.

This plant is a well-laid-out hillside operation, efficient in design and operation. Only 20 men, including everyone (shovel men, drillers, truck drivers in quarry, oilers, crusher and screen-house men and foremen), are required. The plant was redesigned and most of its equipment was furnished and installed by Earle C. Bacon, Inc., engineers of New York City. The construction work was done by the company itself. John Braen is in charge of the plant, while his brother, Abraham, devotes much time to contract work.

North Lake Sand and Gravel Company's New Plant

Economical Construction with Ample Provision for Future Easy Expansion Are Featured in the Design

AT North Lake, Wis., about 30 miles northwest of Milwaukee, there was erected early in 1927 a sand and gravel crushing, washing and screening plant that taken as a whole is an example of a plant economical in first cost and having the assurance of successful operation at the required capacity immediately after the completion of construction work.

Deposit

The deposit, which is located on the Chicago and Northwestern railway, containing 173 acres, has proved very satisfactory to work, running about 25% sand and 75% gravel, with only a small proportion over 8-in. in size. Last season's operation developed a pit to water level and a working face 100 ft. high. Construction work was started March 15 and the plant began actual production in the middle of June and continued working without interruption until the close of the season. It was designed for 2000 tons per day and an ultimate capacity of 3000 tons per day. From the past season's operations, which at times were over 2000 tons per day, it was shown that very little additional equipment will be necessary to obtain the 3000 ton capacity.

The market to be served requires a maximum size of 2-in. gravel and separations at 1¼-in., ¼-in. and ⅜-in. State and city concrete road specifications require material from ⅜-in. to 2-in., and for curb, gutter and sidewalks ⅜-in. to 1¼-in. The plant also makes roofing gravel, ¼-in. to ⅜-in., and torpedo sand, less than ¼-in.

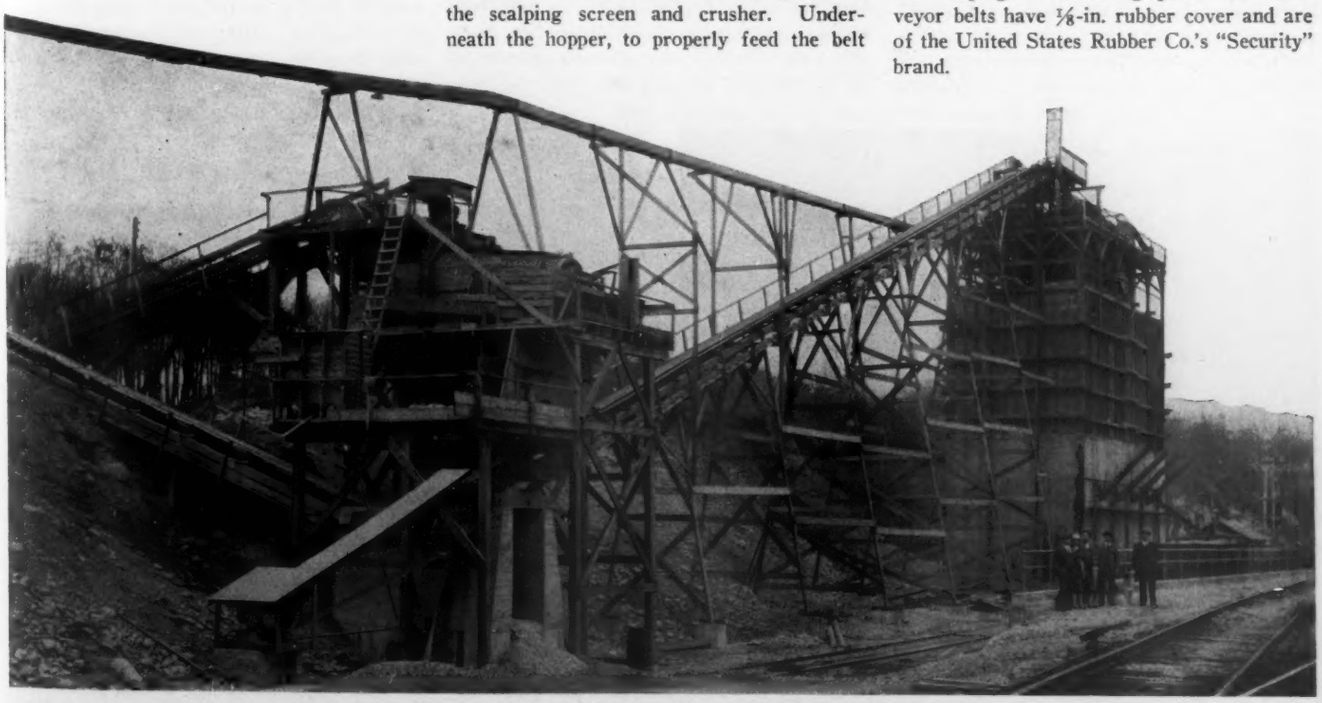
General Operation

The layout illustrated shows the general scheme and the flow of material. All material loaded on the belt conveyor in the pit must pass through a grizzly and it is delivered to a scalping screen from which the fines are fed directly to a belt conveyor carrying the material to the washing plant, while the oversize is crushed and returned to the scalping screen. Thus all material reaching the washing plant is of the required maximum size.

For the first few weeks a ¾-yd., Type "O" Thew gasoline shovel was used in the pit, but was soon replaced by a 1¼-yd. Type 75-A Thew electric shovel, and the smaller one was used for stripping. A field conveyor is used to transport the bank material to the plant. The feed hopper of the conveyor in the pit is of the company's own design and construction. It has a rail grizzly with about 11-in. spaces placed on the top to limit the size of material that passes to the scalping screen and crusher. Underneath the hopper, to properly feed the belt conveyor, a Telsmith plate feeder is used. This is a reciprocating type of feeder which is successfully used in many similar situations.

The belt from the hopper in the pit to the scalping screen above the primary crusher is 30-in. wide, 6-ply set at an incline of approximately 15 degrees and operated at a speed of 250 ft. per minute. It measures 240 ft., centers, and is driven directly by a 30-hp. motor. The conveyor returning the crushed material to the first belt is 24-in. wide, 5-ply, 63 ft. centers, 18 deg. incline and driven at 250 ft. per minute by a 10-hp. motor. For delivering the material to the washing plant a 24-in. belt running at 325 ft. per minute is used. The centers distance is 165 ft. and the incline approximately 18 deg., a 5-ply belt is used and it is operated by a 25-hp. motor. The relative positions of these belts may be seen in the plant layout shown on page 38.

The belt carriers are all placed 4 ft. 6 in. centers and the return rollers are placed 10 ft. centers. They are of the new Galland-Henning type, having removable babbitt bushings in the bearings. The two long conveyors are equipped with gravity type take-ups of the company's own design, one of which can be seen in the illustration of the scalping and crushing plant. All conveyor belts have ⅛-in. rubber cover and are of the United States Rubber Co.'s "Security" brand.



General view of the new 2000-ton per day plant of the North Lake Sand and Gravel Co., North Lake, Wis.

Screening and Crushing

The scalping screen, a Galland-Henning rollerless rotary, is 60-in. in diameter with a screening surface 12 ft. long made of ½-in. plate with 2-in. round perforations and supported on a steel frame. It is driven by a 15-hp. motor belted to a countershaft, and actual power readings showed that less than 6-hp. was required when running with a full load.

To prevent a large circulating load from accumulating, the crusher, which is a 13-A Telsmith gyratory type, is set with an opening approximating 1½-in. While a 50-hp. motor is belted direct to this crusher, less than 40-hp. is actually required.

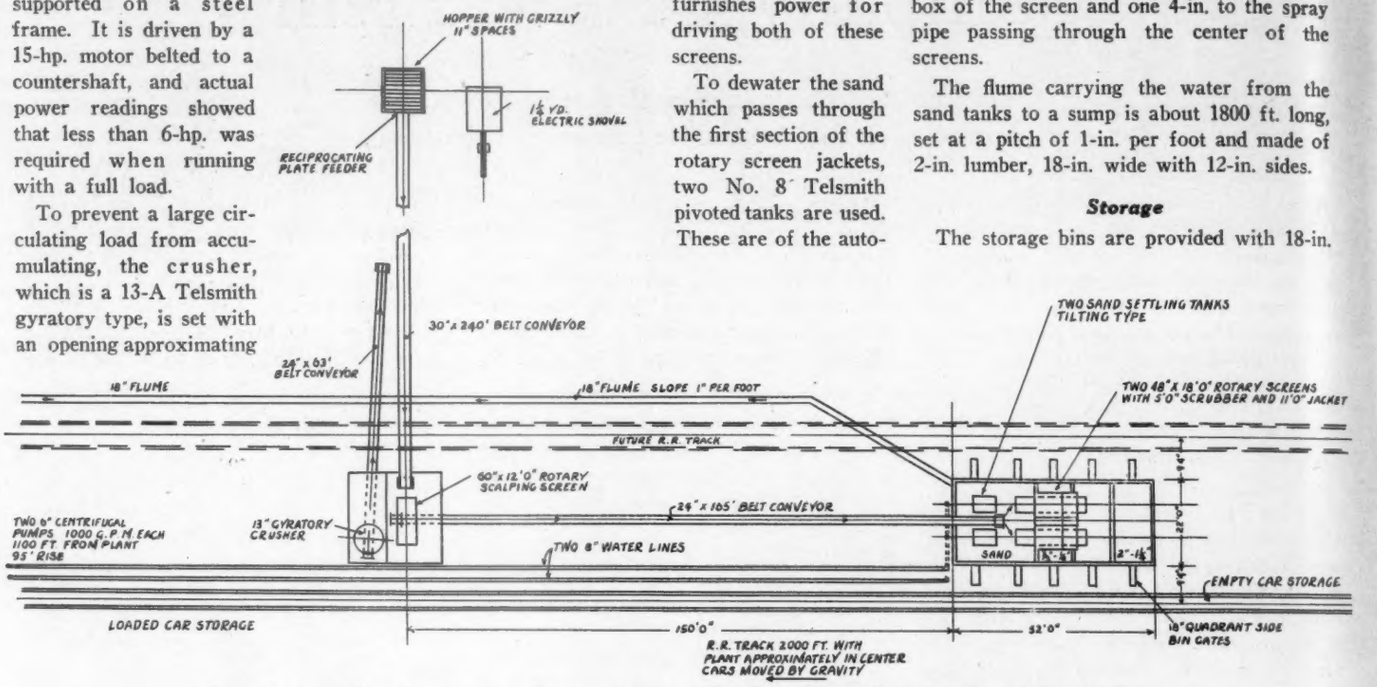
The two washing screens, also of the Galland-Henning rollerless rotary type, are each 48-in. in diameter with total length of 18 ft. The first 5-ft. is a scrubber section, the next 7-ft. is ⅜-in. plate with ⅞-in. perforations, and the last 6-ft. is also of ⅜-in. plate with 1⅜-in. perforations. The jacket is made in two sections, the first 7-ft. of 3/16-in. plate with ¼-in. slotted holes and the next 4-ft. of ¼-in. plate with 7/16-in. perforations. The water spray pipes pass through the entire length of the screens as shown in the illustration, and they are supported at both ends independent of any moving part of the screen. A 30-hp. motor furnishes power for driving both of these screens.

To dewater the sand which passes through the first section of the rotary screen jackets, two No. 8 Telsmith pivoted tanks are used. These are of the automatic tilting type. Approximately 1100 ft. from the plant proper and located on the company's property, two 6-in. American Well Works centrifugal pumps are placed to supply the necessary water. The water is drawn from a stream and each pump is capable of furnishing 1000 gallons per minute. The pumps have an 8-in. suction and 6-in. discharge and each has a separate 8-in. line to the plant, of American spiral riveted pipe. The total rise from the water level to the washing screens is 95 ft. and each pump is driven by a 60-hp. motor, tests having shown that 54-hp. is required. Each 8-in. water line runs directly to the top of the plant and supplies one washing screen. Two leads are taken from each 8-in. pipe, one 3½-in. to the feed box of the screen and one 4-in. to the spray pipe passing through the center of the screens.

The flume carrying the water from the sand tanks to a sump is about 1800 ft. long, set at a pitch of 1-in. per foot and made of 2-in. lumber, 18-in. wide with 12-in. sides.

Storage

The storage bins are provided with 18-in.


HOPPER WITH GRIZZLY 11" SPACES
1½ YD. ELECTRIC SHOVEL
RECIPROCATING PLATE FEEDER
30"x 240' BELT CONVEYOR
24"x 63' BELT CONVEYOR
18" FLUME
18" FLUME SLOPE 1" PER FOOT
TWO SAND SETTLING TANKS TILTING TYPE
TWO 48"X 18'0" ROTARY SCREENS WITH 5'0" SCRUBBER AND 11'0" JACKET
FUTURE R.R. TRACK
60"x 12'0" ROTARY SCALPING SCREEN
24"x 185' BELT CONVEYOR
TWO 6" CENTRIFUGAL PUMPS 1000 G.P.M. EACH 1100 FT. FROM PLANT 95' RISE
13" GYRATORY CRUSHER
TWO 8" WATER LINES
SAND
EMPTY CAR STORAGE
LOADED CAR STORAGE
150'0"
52'0"
18" QUADRANT SIDE BIN GATES
R.R. TRACK 2000 FT. WITH PLANT APPROXIMATELY IN CENTER CARS MOVED BY GRAVITY

Layout of sand and gravel washing and screening plant, North Lake Sand and Gravel Corp.

Electric shovel and grizzly in the pit

Field conveyor carrying material to the sizing plant

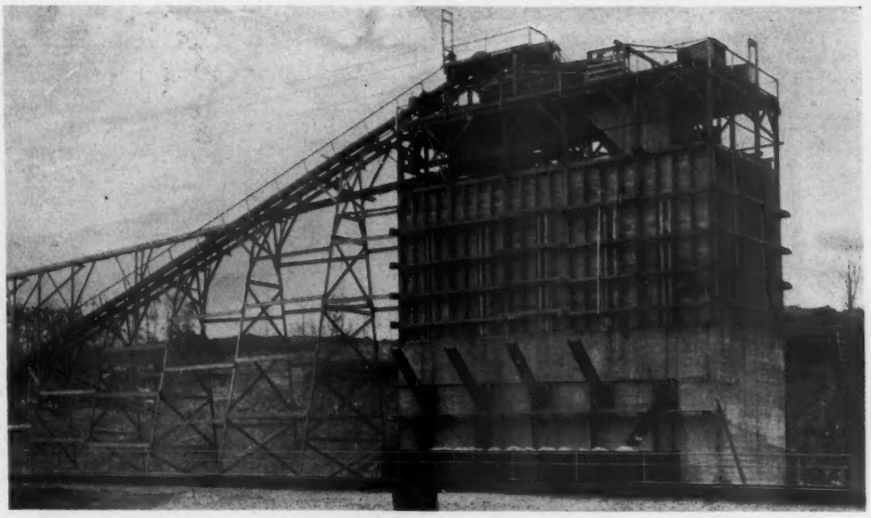
Belt drives are used throughout the plant, all motors are of Northwestern Manufacturing Co.'s make running at 900 r.p.m.

The main storage bin is divided into four compartments, three for gravel each 10x20 ft. and one for sand 20x20 ft. The concrete base under the bins is 24 ft. high, the timber part of the bin is 24 ft. high and the upper structure 10 ft. high. The bin space is 20x50 ft. inside. The posts are 10x10 in., the girths or side braces 6x10 in. and the sides and partitions of 2-in. lumber. The sand compartment has an additional 1-in. matched lumber lining inside to prevent undue leakage.

To make possible a capacity of 3000 tons per day next season, the present 13-A Telsmith crusher will be placed down in the pit to do coarse crushing and another crusher for recrushing will be placed where it now stands.

The North Lake Sand and Gravel Corp. was organized in February, 1927, with offices in Milwaukee, Wis. Chas. J. Petri, Milwaukee, is president; C. E. Randall, Kenosha, vice-president; C. J. Otjen, secretary; Geo. H. Schwartz, treasurer, and L. A. Garrity is manager. All these are of Milwaukee. E. J. De Lany is the superintendent.

The plant was designed and erected under the supervision of Mr. Garrity, who has constructed and operated similar plants during the past 12 years.



Main storage bin divided into four compartments, three of which are for gravel and the fourth for sand

Tire Wear on Concrete and Gravel Roads

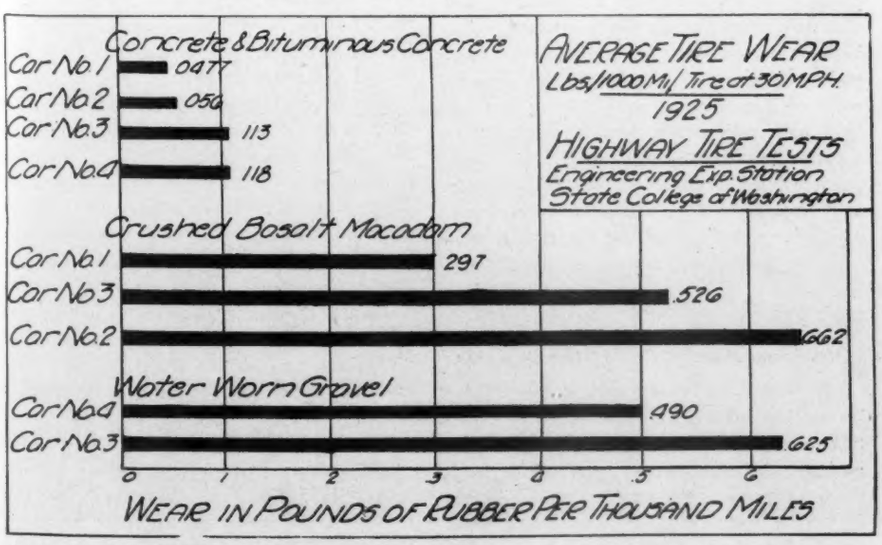
ON the basis of time wear alone, graveled roads bearing a traffic of 500 vehicles per day should, for economy's sake, be paved. This conclusion is a deduction from data gathered by the State College of the State of Washington after a series of scientifically conducted test runs extending over a period of three years in a study of this particular problem.

Tire wear on water-bound macadam and gravel surfaced roads apparently is approximately the same and is about five times faster than the tire wear on a concrete road surface. Tread rubber worn from the surface of the tire on a concrete road surface averaged .093 lb. per 1000 miles as compared with .047 lb. worn away on crushed stone macadam roads, according to the data shown.

For graveled roads of the traffic-water-bound type of construction, comparative tests with the same car on both macadam and gravel showed greater wear on the gravel than on the macadam. As an instance of this note the car listed as No. 3 on the summary chart accompanying this article.

Tread rubber on the average tire costs approximately $10 per lb. and the amount worn off during its average life is 3.45 lb. On this basis the Washington State College finds that on a good crushed stone macadam surface with 500 vehicles per day the tire wear cost for the year is $2590 per mile of road. The cost of tire wear on concrete road surfacing with 500 vehicles per day is $672 per mile. The difference or saving, per year, to motor driving public on an average per day of 500 vehicles on concrete surfacing over macadam or gravel is thus $1918 per mile per year.

Granting the concrete pavement a life of 25 years, the State College finds that spreading the entire cost of the concrete over this period, the average cost per year is $1840. This cost is an average of $78 per year less than the saving of tire wear alone on concrete over gravel or macadam surfacing. And this saving is made on a traffic density no heavier than 500 vehicles per day. At the average of 2500 vehicles per day which many graveled roads carry as, for instance, sections of the Lincoln Highway, the saving in tire wear alone on concrete or macadam would figure five times as great or $9590 per mile per year. The cost of concrete pavement, for estimating purposes, is considered as $30,000 per mile. Tire wear alone in a trifle over three years' time would pay the cost of paving the average road carrying 2500 vehicles per day.—*Service Bulletin of the Iowa Highway Commission.*



Wear of rubber tires on different types of roads

Revision Conference on Slate

IN CONJUNCTION with the annual convention of the National Slate Association held in New York on January 17 and 18 the question of revision of Simplified Practice Recommendations No. 13, Structural Slate; No. 14, Roofing Slate; and No. 15, Blackboard Slate, was taken up. The recommendation on blackboard slate was reaffirmed without change, while the recommendations for structural slate and roofing slate were modified. The industry has suggested to the division that the acceptor list in each one of the three recommendations be revised to include the individual names of all acceptors in lieu of listing only the associations. The conferees recommended that these changes be effective as of February 1, 1928, for a period of one year, subject to the regular annual revision.—*Technical News Bulletin.*

Dolese Bros. Co. crushed stone plant at Richards Spur, Okla.—the largest operation in the state

Southwest Holds Promise of Prosperity to Rock Products Industry

From Iowa to Texas in Belt West of the Mississippi River Business Conditions Look Good

By Edmund Shaw
Editor, Rock Products

THIS EDITORIAL INSPECTION TRIP began in Iowa, about the first of February, and continued south through Kansas City, Topeka and Oklahoma City to Quannah, Texas, roughly parallel to the Mississippi river and about 300 miles west of it. All of the route lies in the prairie country where agriculture is the one great industry. The country traversed has been none too prosperous for the rock products industry the past few years, and the pleasantest thing to record of the trip is that business is much better or that producers really are assured of a good season in 1928.

Iowa and Kansas

Iowa's big highway program and the better condition of farming have given new life to the rock products industry in that state. Prices of aggregates, which were often so low as to cover no more than the direct production cost, have been raised enough to provide something to pay overhead charges.

At Kansas City there are some building projects that are sure to go through, which will need increased production; and a good ballasting program is proposed by some of the railroads centering there that will help out the crushed stone producers. I was told that one railroad which has been using burned shale for ballast for some years had given up its use and will put down only crushed-stone ballast in the future.

At Topeka, where there is a great production of sand from the Arkansas River, and only a small production of other aggregates, all the sand plants were busy making sand-gravel for highway use. The biggest producer of them all, the Consumers' Sand Co., with about twenty plants in Kansas, has built two new plants and has two more under construction. Its plants at Topeka were all busy making sand-gravel, were behind with their orders and were unable to accumulate any storage, which they very much wanted to do, to prepare for the summer months. The sand-gravel highway, which is made by applying a series of very thin applications to any clayey base, seems to have solved the problem of the secondary roads in states with stiff clay soils.

Oklahoma Politics Can't Stop Business

Oklahoma, as every newspaper reader knows, has been seething with political disturbances, but from what I could learn they were of about as much importance to business conditions as the scum on top of the pot is to the soup beneath. The people want good roads and are going to have them. One of the engineers of the highway department said, "The counties are all voting bonds today and want the roads tomorrow."

A number of new plants for producing aggregate and highway material have been built recently. Those that I heard of were built by the Monarch Stone Co. at Tulsa, Dolese Bros. Co. at Bromide (besides entirely rebuilding its plant at Richards Spur, near Lawton), and the Yahola Sand and Gravel Co. and the Muskogee Sand and Gravel Co. near Muskogee.

Nor are these small plants. The Bromide plant of the Dolese Bros. Co. has a capacity for 2000 tons daily and its rebuilt Richards Spur plant a capacity for 4000 tons. This company operates three plants in Oklahoma and one in Texas, and one plant at Buffalo, Iowa, and produces sand at Oklahoma City. The Yahola Sand and Gravel Co. operates six plants, dredging the Grand River; and its newest plant has a 12-in. dredge. All the others have 10-in. dredges. The Muskogee company also operates a number of plants.

It is a bit surprising to see such a large production in a state which has no very large city, Oklahoma City, with perhaps 125,000 people, being the biggest. But there are a lot of fair-sized towns that are grow-

ing, and they build good buildings in them. Tulsa as a whole is perhaps the best looking town in the United States, it has so many modern office buildings, all of them new and clean. In the downtown part of Oklahoma City there are blocks in which one might fancy himself in New York, if the streets were only narrow so as to bring the buildings closer together. Then most of the smaller towns show buildings recently erected or under construction, and of course there are the highways. The market is there, but it is a broad market instead of being concentrated. Mr. Dolese said that he thought the average shipment from his company's Oklahoma quarries traveled nearly 100 miles, and that shipments were regularly made to points 200 and 300 miles distant.

Agricultural Conditions Are Good

The trips in Oklahoma and into the "panhandle" of Texas were made in automobile buses, which gave one a chance to see the country and to talk with a number of people who live there. The surprising thing was that no one spoke of the depressed condition of agriculture. On the contrary, the farmers themselves said that they were doing well, that land was rising in value, and that they know of no farmer who was complaining. The appearance of the country rather bore this out, for the farm houses, although most of them were small, were well painted and had well-kept surroundings. Cotton seems to be the most profitable crop. One farmer told me that he had paid for his land in two crops of cotton, and another said that he had lost everything six years ago but was now worth $20,000, partly from being lucky with cotton crops and partly from the rise in the price of land that he had bought on easy terms and just finished paying for. With such conditions it is easy to see why towns are flourishing and highways are going down. If the modern farmer is not a "gasoline farmer" in the fields he wants his automobile and a good road to run it on, anyway. And the farms themselves offer a considerable market for aggregates, especially in this prairie country where sand banks and gravel pits are few and far between.

Rock Products Industry in Oklahoma

Oklahoma has 16 producers of sand, 12 of crushed stone and six of gravel, according to information given me by Dudley Wood, testing engineer of the highway department. The biggest production of aggregates is around Tulsa, where the sand plants are always in sight along the river from Sand Springs to a point five miles on the other side of the city. They are on the Arkansas River, which is the great source of sand not only at Tulsa but at other parts of its course. At Tulsa, or near it, are about half the stone quarries mentioned above. The remainder are in the southern part of the state, where limestone outcrops in many places. There are said to be some good quarry sites in the northern part of the state which have only been worked by local crushers in Osage county. Only one quarry, that belonging to the state reformatory, is worked for granite; the others are all in limestone. There is one producer of rock asphalt, the Western Paving Co. of Oklahoma City, its output being largely used in street paving, although Mr. Wood said that about 30 miles of state highway were laid with it last year. There is no asphalt from oil refineries to be had, as in Louisiana and California, as most of the oil produced in Oklahoma has a parafine base.

An outcrop of gypsum rock near Medicine Mound, Tex.

Oklahoma's Largest Quarry

Some of the quarries in and near Tulsa I visited a year ago and described in one of these letters. This year there was an opportunity to visit one of the quarries of the Dolese Bros. Co. in the southwestern part of the state, at Richards Spur. The deposit is a great dome of limestone, 300 ft. above the level of the surrounding country, and the quarry face has been cut through it for about a mile. The stone is unusually hard for a limestone; and owing to the dip of the strata away from the center of the dome in all directions, the drilling and blasting methods are unusual. Best results have been obtained by a combination of vertical well-drill holes and horizontal toe holes, in the part of the face now being worked, although other parts may require a different system altogether.

Gravel bar on the Grand river, Okla.

Dredge and flat-car plant on the Grand river

The quarry has been worked by the Dolese Bros. Co. since 1905, and recently they have rebuilt the plant entirely. A description of it will be published later.

Unusual River Deposits of Gravel

Some of the most interesting gravel deposits I have seen are those on the Grand River in Oklahoma. They are bars, some of them containing as much as 30 acres, and they are practically all gravel, the pebbles being from ¼-in. to 2½-in., with about 15% of larger pieces that run to 6-in. and 8-in. cobbles. Practically every pebble is a flint which was once deposited in limestone, and Walter S. Dills, the president of the Yahola Sand and Gravel Co., who has made some study of the subject, says that the flints came from the disintegration of limestone deposits in the Ozark mountains and that they were carried into the Grand River by the many streams in the Ozarks, tributary to it. There is so little sand with the gravel that no attempt is made to save it. The river bottom is shale with very little silt, and the gravel bars contain only a little clay.

Mr. Dills' ingenuity is responsible for the peculiar washing and screening plant that prepares this gravel for the market. It is all contained on a freight car and it includes a grizzly, a rotary screen, a crusher for the oversize, and a sand collector which in this case collects pea gravel. The material is pumped to it by a dredge, and small as the plant is it can produce 40 cars a day. The Yahola company has four of these plants in operation at the present time, besides other plants which produce pit-run material for ballast and sand plants on the Arkansas River, near where the Grand empties into it.

The company owns seven miles of the river front on the side which has a railroad connection and has laid its own tracks for part of this distance. It was found that one of the heaviest expenses was that of moving the plant as the bar that was being worked was depleted. After some experimenting with semi-portable types, Mr. Dills designed this flat-car type, which is entirely portable. In fact, the writer saw one being packed up and made ready to move to a point some miles distant. But such a plant has no bins and no facilities for loading more than two products (in this case concrete aggregate and pea gravel for road dressing), so it could not well be used where several sized products had to be made. However, it is an excellent example of good engineering, which is the best adaptation of method and machinery to the condition to be met.

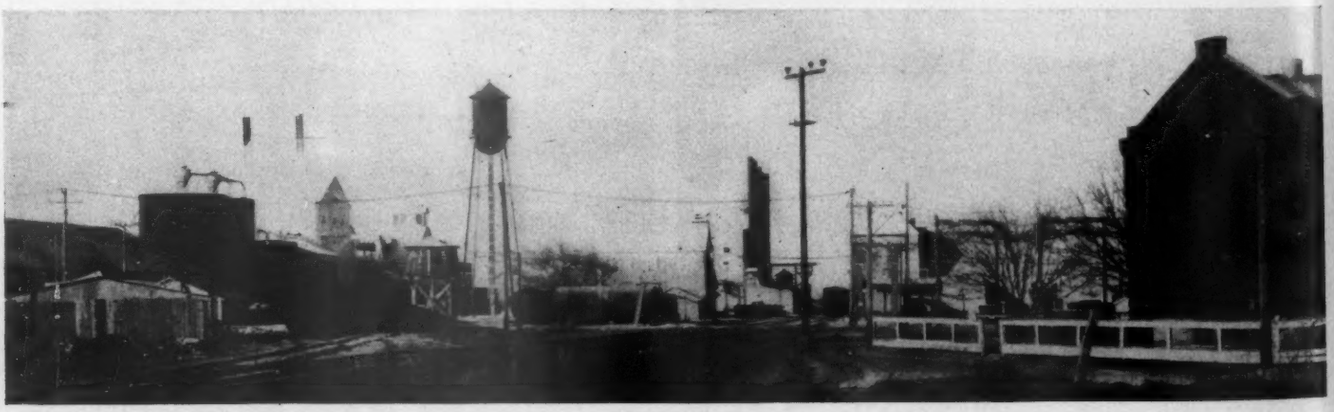
These operations on the Grand River are at or near Fort Gibson, about 13 miles from Muskogee. The Muskogee Sand and Gravel Co. also operates plants near Fort Gibson, one of which is of a more conventional type than that just described. Aside from the Grand River production, not much gravel is produced in Oklahoma, although there are deposits near Lawton, worked by the Industrial Sand and Gravel Co., and others at Dougherty and Comargo, worked by the Western Paving Co., the Makins Lumber Co. and the Comargo Sand and Gravel Co. These were not visited, but the deposits are said to be old river terraces, the sort of deposit that furnishes so much of the sand and gravel produced outside the glacial area.

A gypsum "sink" or opening to an underground solution channel at Acme, Tex.

Worked gypsite land, illustrating that the gypsite was deposited on an old eroded surface

Texas Gypsum Deposits

This part of the trip ended at Quannah, Texas, not far from the Oklahoma line.



General view of the gypsum products plant of the Certain-teed Products Co., Acme, Tex.

This is in the great Texas gypsum deposits which cover so large an area. The United States Gypsum Co. has a plant at Eldorado and the Certain-teed Products Corp. and the Beaver Products Corp. have plants at Acme, near Quannah. Both gypsite and rock gypsum furnish the materials for these plants, the gypsite in many cases lying over the rock gypsum. M. L. Tyrrell, the mining engineer of the Certain-teed Products Corp. mine, says that these gypsum deposits are of quite different geological ages, however. The rock was formed in the Cretaceous period and the gypsite in the much more recent Pleistocene. Some interesting fossils, including the tusk and teeth of an elpas, the successor to the mastodon, have been found under the gypsite.

The Certain-teed corporation digs the gypsite with tractors and wheeled scrapers and occasionally they uncover what is known as a "gypsum sink," a hole leading to an underground water course, or solution channel. Some of these sinks are large enough to be dangerous, and there is a legend to the effect that some years ago one of them swallowed a horse and buggy and the driver so completely that they could not be recovered.

Working a gypsite deposit with tractors and scrapers at Acme, Tex.

Gypsum is everywhere throughout this part of the country. On the way out to a gravel plant near Chillicothe, Texas, the road passes through some much eroded red hills and the gypsum exposed shows like a white streak along the sides of them for some miles. But not all of the gypsum or gypsite found here is of good grade.

That which is mined by the Certain-teed Products Corp., however, is unusually pure, running 98% $CaSO_4 \cdot 2H_2O$ and free from anhydrite. The fresh faces of it underground are almost snow white. This company has worked its deposits for about 20 years and has recently erected a very modern calcining plant and wallboard plant which will be described in an early issue.

How Can We Effectively Support Campaigns for Public Improvements?*

By C. D. Franks
Portland Cement Association, Chicago, Ill.

THE SPECTACLE of the American citizen as he goes to vote is seldom inspirational. I am speaking of the average man, the man whose voting franchise, for good or ill, determines the destiny of our nation. He's a good fellow, amiable, a good husband, a fond father and all that sort of thing. But see him as he goes to vote.

At the corner half a dozen partisans of as many different candidates thrust handbills at him. He walks the next hundred feet idly considering the names and faces of a lot of beaming candidates who, although utter strangers, have suddenly developed a tenderly solicitous enthusiasm for him. He enters the polling place, stuffs the dodgers into his pocket, gets his ballot and retires into the sacred realm of the voting booth.

"Now," he says, "I shall vote. My father was a Republican and the Democratic candidate's name is Percival. I shall vote Republican. So much for that."

He goes down the ballot, dispassionately distributing the favor of his patronage. And then he frowns, for he has come to the section on bond issues for public improvements. His instincts for businesslike procedure impel him to read at least a part of the text describing the first proposed improvement, but it's tough going. The men who do that sort of writing are seldom entertaining writers. At any rate, by the time he has discovered that the improvement is to be a large one, running into many millions of dollars, his pocketbook begins to talk to him.

C. D. Franks

"Fifty millions, eh? Sounds like graft. What would *I* do with fifty million? Boy! That insurance premium's due next month. The kid's got to be educated and Helen's raising ned for a new rug. Nope, nothing doing. Can't afford it."

And he scrawls a lusty black cross in the "NO" box.

We understand perfectly his reasoning. We sympathize with him. But we also realize that this amiable gentleman and his millions of brothers throughout the country are victims of ignorance and indifference which, unless they be eliminated, may serve to block the material progress of the land.

Most of us here today are acutely interested in public improvement projects. For one thing, we honestly believe in the value to the public at large of these improvements. And, in the second place, we have allied ourselves, in a business way, with the means for providing these improvements.

How are we to transmit our enthusiasm and our knowledge to the average citizen so that, when the crucial moment comes in the

*Paper delivered at the 11th Annual Convention, National Crushed Stone Association, West Baden, Ind., January 19, 1928.

voting booth, he will not permit temporary, personal and relatively unimportant factors to control his judgment?

"Get the Facts to the Average Man"

Every successful bond issue has contributed to our fund of knowledge on this subject, but, while methods vary from place to place and time to time, there is one dominant principle which must be observed. It is simply this: Get the facts to the average man.

I do not discount appeals to the voters' community loyalty and pride; I do not object to more or less elaborate ballyhoo, but unless facts receive the major emphasis, the campaign may fail; or, and worse, result in a wave of public reaction against all improvements, which may handicap the community for a long time.

Once a man knows something about anything, no matter what, he becomes interested in it. And that personal interest will serve amply to over-ride petty prejudices or indifference. Take, for example, a bond issue for certain highway improvements. Our friend, the average citizen, should know and be able to visualize (1) where the road or roads are to be located; (2) the immediately resulting benefits to his own community; (3) the type of road to be built; (4) the inadequacy of the present roads, and (5) the effect of the improvement on his own personal well-being and expenses.

There are, of course, many other points which must be dwelt upon in the course of the campaign, but it is wise to remember that any man, any one of us, is an essentially self-centered being. We may not be selfish in the ordinary sense of the word, but our judgment is inevitably influenced by what we feel will benefit or damage our own lives and the lives of our family and friends.

With this in mind, then, let us consider the work of the campaign, assuming, of course, that the soundness of the proposed improvement, from both economic and engineering points of view, has been well established.

Formation of a Promotional Organization

The type of organization to be built up depends, naturally, on the scope of the project. But in any case there will need to be a well identified center of authority and information, a series of district captains, subdistrict leaders and, finally, local workers.

Naturally, I am most familiar with campaigns organized to promote hard roads bond issues. One of the most complete and effective of such organizations was that which carried to a successful culmination the campaign for good roads in Missouri, a few years ago. In this instance the Missouri Statewide Good Roads Association joined forces with the State Highway Commission. Directly responsible to the executive committee of the association were committees on publicity, speakers, finance, entertainment, transportation and work at the polls. Working out from the executive committee were two state chairmen, one for the men's organization and one for the women's, each of whom directed the energies of division chairmen, county managers, county district managers and subdistrict workers.

While this type of organization may seem complete, it must be remembered that the job to be done required intensive and far-reaching work. The men in isolated farming sections had to be interested; women in out-of-the-way villages had to be made to feel that the statewide highway project was of prime importance to them. Informal, word-of-mouth "advertising" is still the most effective means of influencing anyone; hence the careful follow through the effort down to the subdistrict workers.

In less than state-wide projects it is possible, and often advisable, to use simpler organizations. It has been said that we Americans have a genius for organization. That is true enough, but we are likewise tempted to let our genius for organization load us down with top-heavy, bulky machinery which is often more decorative than efficient. Overhead and operating expenses have ruined many a beautifully organized business.

In any campaign looking toward a bond issue there must be a division of labor and responsibility. Somebody must be responsible for raising funds to carry on the promotive work; someone else must focus and direct the advertising work, whether by word of mouth or by any other medium, and there must be someone else to co-ordinate all the work that is done.

Importance of Publicity

Granted that we have an organization capable of functioning without friction, the next step is to get the committee on publicity to work. This committee is of the utmost importance. No business man needs to be told that publicity can make or break an enterprise. It is therefore essential to find publicity men who are intelligent, experienced and enterprising, men who can work with newspapers without antagonizing the editors. As a general rule, any really vital program of public improvement will receive the backing of newspapers without stint, but no editor will long co-operate with a publicity man who is more interested in grabbing free space than in providing good, readable copy.

Publicity, as a fine art, is often scorned by the papers because it is so patently an attempt to get something for nothing, a bid for space with no legitimate news ingredient. But publicity can be and often is as interesting and as newsy as anything gathered by a paper's own staff. The successful publicity man is capable of putting honest news value into his stuff, and when he does that the editor will not only print it but welcome more.

Not all publicity need be in the news columns of the papers. Nicely timed, paid advertisements can do wonders in informing the public of the project. Likewise they aid materially in maintaining the happiest relations with the newspapers.

The ramifications of publicity enterprise may be endlessly extended. In every community there are trade papers, class publications and many other journals which the careful publicity department uses. News stories, written with their various special interests in mind, will almost invariably be found acceptable. Billboards, posters, slides for showing at motion picture theaters—these and many other forms of publicity will be found effective.

Speakers, Meetings and Banquets

The committee on speakers can be important or not, depending on the care with which speakers are chosen and speaking dates made. It is not often that one man can be found who will appeal to several different types of audiences. For example, consider how difficult it would be to find a man who could present the cultural and social advantages of a good roads system to women's clubs, the commercial and financial aspects of those same roads to Rotary and Kiwanis clubs, the labor phase of the project to meetings of labor, and the economic significance to chambers of commerce. It might be done, but I do not envy such a man his job.

In the course of some campaigns it has been found expedient to give large and inspirational banquets. Any man who has ever arranged a banquet will be my authority for the statement that nothing is so easy to make as a dull banquet and nothing so hard to arrange as a lively, result-producing one. Mass-meetings present somewhat different problems. The prime essentials of such meetings are spread-eagle oratory, brass bands and a deliberate use of the principles of crowd psychology. Mob hysteria can be a bitterly cruel thing, heedless and insane; but properly guided to serve a legitimate cause it can be constructive and effective.

I am going somewhat into detail in order to provide a background for my remarks on the main theme, which is—how can the industries which we represent effectively tie into the promotion of such a campaign?

Some Remarks on Slogans

For some twenty years, now, America has been a country of slogans. Some of our amiable critics have said that it is typical of us to get a catchy slogan, organize a company, and then begin to deliver goods suggested by the slogan. Be that as it may, there can be no discounting the fact that a good slogan can be made a real asset in any enterprise, providing we master the slogan and do not let it master us. A vivid slogan in connection with the promotion of public improvement projects can be of honest value. However, I suggest that we benefit by the experience of others and disregard flamboyant superlatives. I doubt that much is gained by

claiming that any one improvement will bring in the millennium. Likewise, make your slogans pertinent. I have in mind one good roads campaign slogan which was, in effect, "Podunk Forever." This was capable of interpretation in many ways and was doubtless an estimable sentiment, but it sold no roads.

As I have said, the major function of any promotion enterprise is to get the facts to the people. If the goal is roads, specify roads. If it is a dam, don't let it be confused with a new park system.

Questions and Answers

One of the most effective pieces of general promotion is the presentation of questions and answers on the subject of the proposed improvement. Shortly before one of Pennsylvania's bond issue polls, a pamphlet was broadcast containing a dozen questions together with definite answers to them on the proposal to issue $50,000,000 worth of good roads bonds. The questions ranged from such an elementary one as, "Why borrow money to build roads?" to more technical ones on federal aid and the influence of the bond issue on taxes. This device is a good one; it raises healthy doubts in the minds of the voter and then presents equally healthy but constructive answers. In other words, it is a means for presenting facts.

Speaking of doubts, every campaign must expect to meet a degree of opposition which may be healthy or otherwise, honest or dishonest. It is a well established fact that those who are opposed to any project are far more certain to go to the polls and vote than those who are either indifferent or even in favor of it. The opposition carries a grudge, as it were, and it's human nature to play a grudge to the limit.

Getting Out the Vote

In order to meet this situation, it is necessary to promote, along with the main idea of the campaign, a drive to get out the vote. If you can get to the polls the majority of the lukewarm and mildly interested people, they will vote on your side. But the job is in making them see that voting is necessary. Most of us have a "Let George do it" complex and it's a very hard thing to kill.

In getting out the vote there are several avenues of approach. There is direct-by-mail appeal to thousands of substantial men whose standing in their communities indicates that, were they to vote at all, they would be on your side. Then there are the Kiwanis clubs, the Rotarians, the chambers of commerce, the ad clubs and the fraternal organizations, all of which are or can be highly influential in getting men and women to the polls. Display advertising of all kinds, whether in publications or in poster form, may well stress the word "Vote!" with its connotations of voting on the construction side of the issue.

There are few industries which cannot be lined up to aid in the campaign. I do not mean by this that they should be expected to contribute financially; that is a factor which must be determined solely on the basis of taste and judgment in any locality. But I do mean that most business organizations will be found to be willing supporters of and workers in the campaign itself. Many of them will contribute, for example, a display advertisement in the newspapers, stressing the benefits to be gained by the project, and, incidentally, presenting themselves in the light of forward-looking, progressive concerns. Likewise, they can do effective work in presenting the facts of the situation to their employes and in encouraging them to vote.

Co-operation from Interested Business Concerns

Certain industries which are more or less intimately allied with the project will be found anxious to co-operate even more actively. For example, chains of filling stations have often co-operated with the publicity committees of good road campaigns by distributing leaflets and other literature. Similarly, automobile stickers have been handed to motorists by garage and filling station men.

Stores and banks, in some instances, contributed display window space. Cleverly designed models of the improvement itself invariably attract public attention and serve to vivify the project in the minds of those to whom the printed word is not pictorial.

In any public improvement campaign the part of such businesses as are represented here depends largely on local conditions. In general, it may be said that the expert assistance you are equipped to give will be most appreciated. For instance, if you maintain a publicity department, offer its services freely. If you have any literature describing the part your product played in similar public improvements, adapt it to meet the local situation. Instruct your salesmen and field men to refer tactfully to the proposed work in all their contacting. I say "tactfully" because your self-interest in the project must be kept in the background.

Financing Campaigns

In regard to campaign contributions there can be no definite, cut-and-dried procedure. Campaigns have to be financed and it is natural that those who will benefit directly or otherwise in the realization of a campaign's goal may well be expected to participate in the money raising. However, as Messrs. Smith of Illinois and Vare of Pennsylvania can attest, there are dangers in campaign finances, no matter how altruistic one's motives may be. Every man must be his own judge in determining the extent to which he and his firm will participate.

It is a difficult subject at best; one in which there are delicate balances and dangers. But this much can be said: The firm which contributes to any such fund and does so most frankly and with the fewest strings tied to its contribution will be the firm which profits most in the long run.

Every time a campaign is swung into action, there is something of the old Liberty Loan drive spirit revived. All of you remember the frenzy of those days, days filled with the blare of massed bands, the full-throated oratory of thousands of four-minute men and myriad of other excitements. We cannot hope to recapture that fine, careless rapture. I am not at all sure we want to. Our purposes are far different, our times are of a different mood. With no real loss of love for our country we have become a little skeptical of highly emotional appeals.

However, we must have enthusiasm in promoting our public improvement campaigns, and we must have plenty of it. But we cannot expect to get anywhere on enthusiasm alone. The law of diminishing returns is never more active than in this matter of emotion. A certain degree of popular excitement may put over a project today, but to promote a similar project tomorrow we must work up a much more intense wave of emotion. And so on. There are no absolutes in the emotional appeal. But facts are facts, yesterday, today and tomorrow. Circumstances may change, but the basic facts remain. On them we must base our appeal to the mind of the public.

There is an ancient law of journalism which is drummed into the head of every student of that art early in his training. It is called the Law of the Five W's. It provides that early in every news story the five W's of Who, What, Where, When and, if possible, Why shall be defined. If, in carrying on our campaigns, we send the voters to the polls fully informed on the W's of the proposition, we need not fear that the privacy of the voting booth will be but a protection for his prejudice and indifference.

Cement Materials of Kentucky

THE specific information on Kentucky cement materials contained in the new report, "Cement Materials of Kentucky," by C. H. Richardson, assistant geologist, Kentucky Geological Survey, has been gathered to locate definitely the limestones and clays in Kentucky which are suitable for cement manufacture. Its chief purpose is to provide data of practical value to industries interested in these products and other individuals with only an indirect interest in their possible use. It is intended only as a discussion of possible cement materials of the state, and in this respect it is admirable.

The report gives definitions of different kinds of cements and their characteristic properties, data on cement manufacture from quarrying to calcining, grinding and sacking, a brief survey of the cement industry in the United States and the distribution of raw cement materials in Kentucky.

A chapter on the chemical analyses of various limestones, clays and shales of the state is included in the report.

Combination of Lime in Portland Cement Compounds*

Influence of Replacements of Magnesia, Soda and Potash for Lime and of Ferric Oxide for Alumina in the Burning of Portland Cement

By W. C. Hansen and R. H. Bogue
Portland Cement Association Fellowship, Bureau of Standards, Washington, D. C.

THE researches of Rankin,[1] Bates,[2] and others have indicated that it is desirable to have in portland cement as large a percentage of lime as is economically possible to bring into combination with the acidic constituents. The presence of uncombined lime, however, is generally regarded as undesirable, as it is believed by some to be in part responsible for excessive expansion of mortars and concretes. It is generally believed that the oxides, such as ferric oxide, magnesia, and the alkalies, are not themselves important in forming hydraulic products in portland cement,[3] but that they make it possible to produce the hydraulic combinations of lime, alumina, and silica in less time and at lower temperatures than would obtain if they were absent. The extent of their usefulness is not known except in a qualitative way based upon the experience of operators in burning various cement mixes.

A series of investigations has accordingly been undertaken to determine quantitatively the influence of small amounts of magnesia, ferric oxide, alkalies, and other minor components on the combination of lime attained in various mixtures at various temperatures. The present report describes the furnace and materials used, the procedure adopted, and the data obtained on one base composition.

IN the process of portland cement manufacture, lime and other basic oxides combine with silica and other acidic oxides. The completeness with which lime enters into combination can be measured. In this study there is noted the influence of replacements of magnesia, soda, and potash for lime, and of ferric oxide for alumina, on the temperature required for burning and the completeness of combination of the lime. Only one base composition is employed here; others will be reported later.

A continuously operating electric resistance furnace was designed especially for this investigation. Temperatures up to 1550 deg. C. are readily obtained under conditions which permit of a control to 10 deg. C., satisfactory duplication of results, freedom from contamination of materials, and an output of about 2 lb. of product per day.

The completion of this program will result in an understanding of the influence of the several minor components of portland cement on the phases produced, the burning temperature required, the extent of combination, and on the cement properties of the products, under a wide range of compositions.

The Furnace

It was first necessary to design and build a furnace which would meet the particular requirements of this study.

In the rotary kiln, which is the standard equipment for commercial cement manufacture today, the materials advance through the kiln and in so doing are gradually heated to a maximum temperature and then cooled rather rapidly. It was desired to heat mixtures in a similar manner and to control the time and rate of heating, as well as the maximum temperature to which they were heated. The studies were to be made upon pure materials, and it was therefore necessary to avoid contamination during the heating process. Also, a capacity of from 1 to 2 lb. of product per day was required.

A photograph of the furnace in operation is shown in Fig. 1, and a cross section in Fig. 2.

Operation

Boats of 0.125 mm. sheet platinum are employed as containers for the charge. These fit loosely into alundum boats 6x1.25 in. (15x 3.6 cm.) and 0.5 in. (1.3 cm.) deep. The alundum boats are used as supports for the

*Reprinted by special permission from *Industrial and Engineering Chemistry* (1927), 19, 1260-64.
[1]*Ind. and Eng. Chem.*, 7, 466 (1915).
[2]*Concrete-Cement Age* 2, 3 (1913).
[3]Klein and Phillips, *Bur. Standards, Tech. Paper* 43 (1914).
[4]*Phys. Rev.*, 23, 449 (1906).

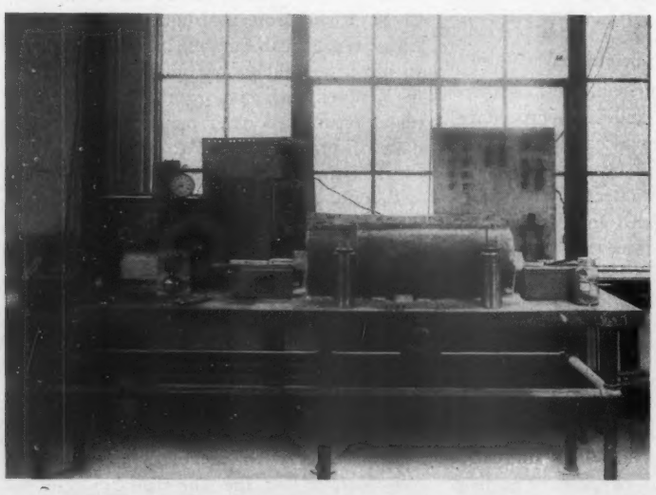


Fig. 1. Electric resistance furnace for studying combination of lime in portland cement compounds

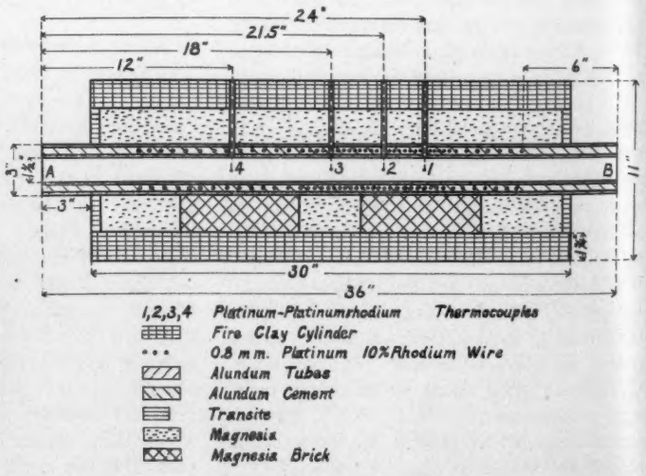


Fig. 2. Diagrammatic sketch of the continuous electric resistance furnace of special design

platinum to avoid unnecessary wearing away of the platinum by abrasion as the boats are passed through the furnace. The boats hold from 25 to 35 grams of mixtures of calcium carbonate, silica and alumina, and so yield 15 to 20 grams of product per boat. They are entered at *A* and advanced in steps of 1 in. (2.5 cm.) every two minutes. Thermocouples are inserted through the openings so that the boats pass just under their junctions.

The conditions under which the furnace gave the most satisfactory performance were determined by making runs in which the temperatures at the points 1, 2, 3 and 4, and also the rate of advance of the charges, were varied. It was found that the maximum temperature should be maintained at points 2 and 3. When these two points were held at approximately the same temperature, and point 4 was 200 to 300 deg. C. lower, and the boats were moved forward at the rate of 1 in. every two minutes, the temperature over the distance between points 2 and 3, or about 4 in. (10 cm.), could be controlled to within ± 10 deg. C. The temperature of point 4 then varied with ± 20 deg. C. The temperature at point 1 is dependent upon the temperature at point 2, as these points are in the same heating unit, and is measured to give an idea of the rate of decrease in temperature from the maximum. Temperatures up to 1550 deg. C. were readily obtained. A representative curve of the temperature gradients is given in Fig. 3.

After establishing the conditions for the desired operation of the furnace, it was necessary to determine whether the temperatures measured above the charges were a measure of the temperatures within the charges. Readings were taken with the thermocouples above the charges and again when they were pushed down into the charges. Those taken above and within the charges did not differ more than ± 5 deg. C. when the rate of advance was 1 in. (2.5 cm.) in two minutes. Therefore the temperature above the charge is the same as the temperature of the charge within the accuracy of the furnace control, when the rate of advance of the boats is 1 in. in two minutes.

Experimental Method

Since the production of the hydraulic constituents during burning involves a simultaneous reduction in the free lime present, it is sufficient to determine the extent of combination following any given treatment by noting the percentage of uncombined lime remaining in the product. The free lime was determined by the method described by Lerch and Bogue.[5] This method has been applied to many laboratory products and commercial cements and has been found reliable and satisfactory.

Especial care was used throughout this study to eliminate as completely as possible the factors usually present which make for unreliable or difficult interpretation of data. There are three factors in studies of this kind which play an important part but which

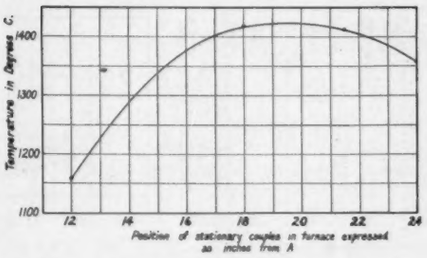


Fig. 3. Representative curve of heating process obtained by maintaining points 2 and 3 at a constant temperature

cannot be defined absolutely—surface of contact, homogeneity and nature of the raw materials. These factors, as described below, have been so controlled in this investigation that it is believed that the results of these experiments are directly comparable.

In the manufacture of portland cement some of the reactions take place between solids and liquid.[1] Such reactions are influenced by factors that cannot be defined accurately, and therefore cannot be controlled except in a general way. The rates of reactions which involve solid phases, or solids and liquid, depend upon the surface of contact and uniformity of the mixture. The surface of contact is a function of the fineness of the solid materials and is usually defined in terms of the size of the largest particles—i.e., the mesh through which all the material will pass. This, however, does not give an accurate measure of the actual surface of contact.

Furthermore, the time period during which there is liquid present in commercial practice is not very great and perhaps does not allow for complete diffusion into large particles nor for such diffusion as may correct any great amount of inhomogeneity.

The materials used in this investigation were ground to pass a 200-mesh sieve. A quantity of each component sufficient for the entire study was made at the start and used for all samples. The materials were mixed, after weighing out the desired quantities, by stirring them together in a beaker with water to form a thin paste. After drying at 110 deg. C. the samples were thoroughly ground in a porcelain mortar. This method seemed to give a uniform product.

The raw materials consisted of calcium carbonate, potassium carbonate, sodium carbonate, basic magnesium carbonate, silica, alumina and ferric oxide. The partial compositions of these material are given in Table I.

Rankin[6] demonstrated the difference in reactivity of various forms of silica in the formation of $2CaO \cdot SiO_2$ and pointed out that the silica as found in cement raw materials might be in a much more reactive state than any which he used. It seems entirely possible that the speeds of the reactions, starting with oxides and carbonates, may be quite different from those of practice. Therefore, one is not permitted to apply to practice without some reservations results obtained with these materials.

The duration and temperature of heating have a considerable influence on the amount of combination attained in any mixture such as these studied. These factors were controlled definitely in this investigation by the use of the specially constructed furnace described above.

Experimental Data

The average composition of portland cement today is close to the following: CaO, MgO, Na_2O and K_2O, 67%; Al_2O_3 and Fe_2O_3, 10%; and SiO_2 23%. The following composition was chosen accordingly as the base composition in this preliminary study: CaO 67, Al_2O_3 10, and SiO_2 23%. Various mixtures were then investigated in which a part of the calcium oxide was replaced by magnesia, soda or potash, and a part of the alumina was replaced by ferric oxide.

As previously pointed out, the values obtained in this study with respect to temperatures and degrees of combination cannot be considered as absolute because of uncontrollable factors, but those of each series are comparable and the different series are to a considerable degree comparable with each other. This is shown to be true by the following examples:

Two charges of the same composition—CaO 67, Al_2O_3 10, and SiO_2 23%—were heated during the same run but with two boats between them. The first charge was found, after heating, to contain 6.0% free calcium oxide and the second 5.9%. Two charges of another composition—CaO 63, MgO 3, Na_2O 1, Al_2O_3 10, SiO_2 23%—were run on different days. The temperatures were the same within ± 10 deg. C., and the percentages of free calcium oxide found

[5] *Ind. and Eng. Chem.*, 18, 739 (1926).
[6] *Concrete*, 21, 72 (1922).

TABLE I—PARTIAL COMPOSITIONS OF RAW MATERIALS
(Figures in per cent)

Raw Material	$CaCO_3$*	Al_2O_3*	SiO_2*	Fe_2O_3*	$MgCO_3$-Mg-$(OH)_2$*	K_2CO_3†	Na_2CO_3‡
SiO_2	Nil	0.01	99.37	.....	0.09	0.0031	0.003
Al_2O_3	0.08	98.48	0.0346	.....	0.07	0.0026	.....
Fe_2O_3	0.01	0.002	0.018	99.15			Fe, 0.001
FeO	.....	.....	.....	Nil	.....	.....	.....
CaO	55.73	Nil	0.15	.....	0.06	.....	Ca. 0.007
MgO	0.01	.....	.....	.....	36.19	.....	Mg. 0.004
Alkalies	0.04	.....	.....	.....	.....	.....	.....
H_2S metals	.....	.....	.....	.....	.....	Nil	.....
SO_3	Trace	.....	.....	Nil	Nil	.....	.....
Cl	Trace	.....	.....	.....	.....	.....	.....
HCO_3	.....	.....	.....	.....	.....	.....	.....
CO_2	44.10	.....	.....	.....	.....	.....	.....
Loss on ignition	.....	1.42	0.21	0.93	63.99	.....	.....
H_2O at 100 deg. C.	.....	.....	0.02	.....	.....	.....	.....

*By H. C. Stecker.
†Taken from label on sample as purchased from Baker and Adamson.
‡Taken from label on sample as purchased from Powers-Weightman-Rosengarten.

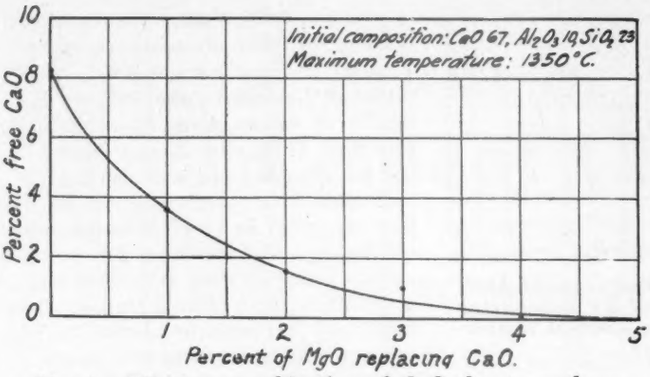


Fig. 4. Effect on combination of CaO due to replacement of CaO by MgO up to 5%

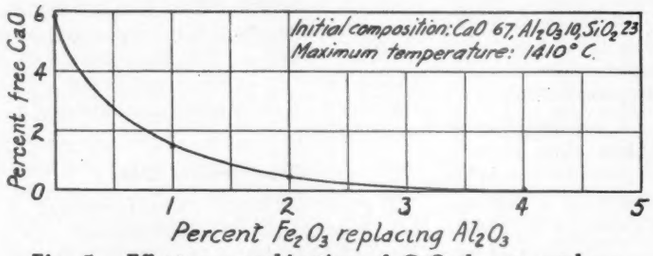


Fig. 5. Effect on combination of CaO due to replacement of Al_2O_3 by Fe_2O_3 up to 4%

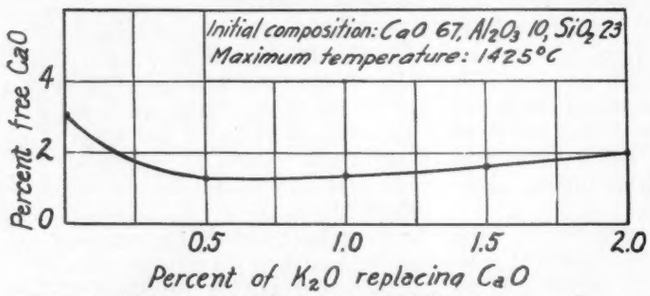


Fig. 6. Effect on combination of CaO due to replacement of CaO by K_2O up to 2%

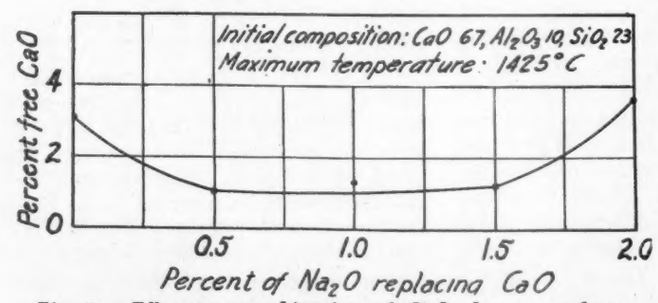


Fig. 7. Effect on combination of CaO due to replacement of CaO by Na_2O up to 2%

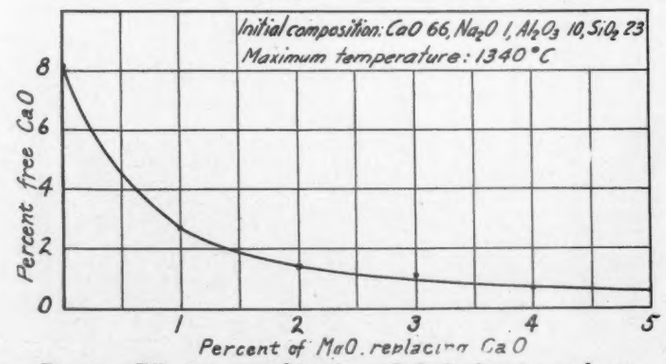

Initial composition: CaO 66, Na_2O 1, Al_2O_3 10, SiO_2 23
Maximum temperature: 1340°C
Percent free CaO
Percent of MgO replacing CaO

Fig. 8. Effect on combination of CaO due to replacement of CaO by MgO in the presence of Na_2O

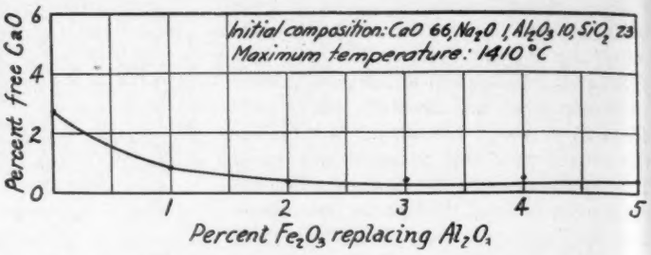

Initial composition: CaO 66, Na_2O 1, Al_2O_3 10, SiO_2 23
Maximum temperature: 1410°C
Percent free CaO
Percent Fe_2O_3 replacing Al_2O_3

Fig. 9. Effect on combination of CaO due to replacement of Al_2O_3 by Fe_2O_3 in presence of Na_2O

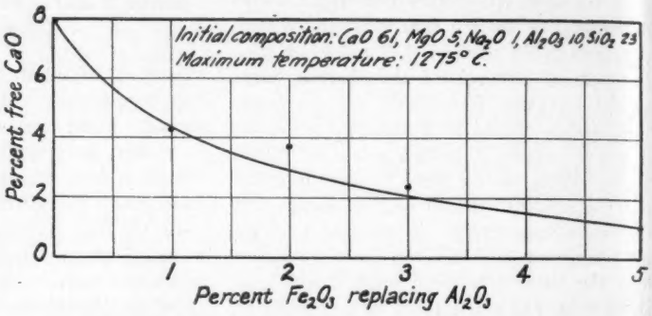

Initial composition: CaO 61, MgO 5, Na_2O 1, Al_2O_3 10, SiO_2 23
Maximum temperature: 1275°C.
Percent free CaO
Percent Fe_2O_3 replacing Al_2O_3

Fig. 10. Effect on combination of CaO due to replacement of Al_2O_3 by Fe_2O_3 in the presence of MgO and Na_2O

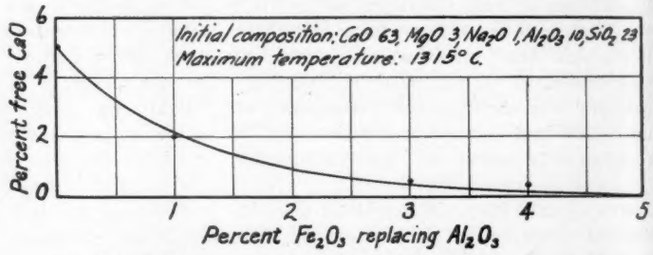

Initial composition: CaO 63, MgO 3, Na_2O 1, Al_2O_3 10, SiO_2 23
Maximum temperature: 1315°C.
Percent free CaO
Percent Fe_2O_3 replacing Al_2O_3

Fig. 11. Effect on combination of CaO due to replacement of Al_2O_3 by Fe_2O_3 in presence of Mgo and Na_2O

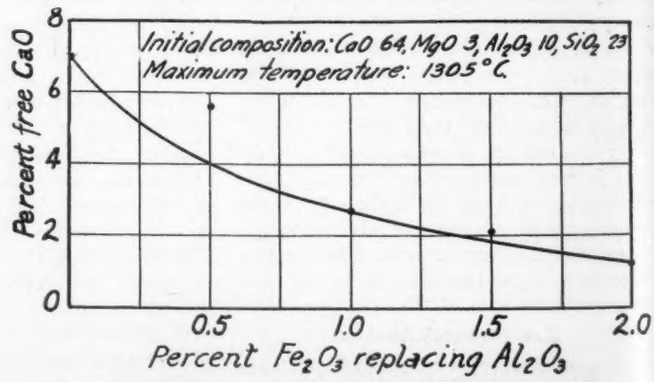

Initial composition: CaO 64, MgO 3, Al_2O_3 10, SiO_2 23
Maximum temperature: 1305°C.
Percent free CaO
Percent Fe_2O_3 replacing Al_2O_3

Fig. 12. Effect on combination of CaO due to replacement of Al_2O_3 by Fe_2O_3 in the presence of MgO

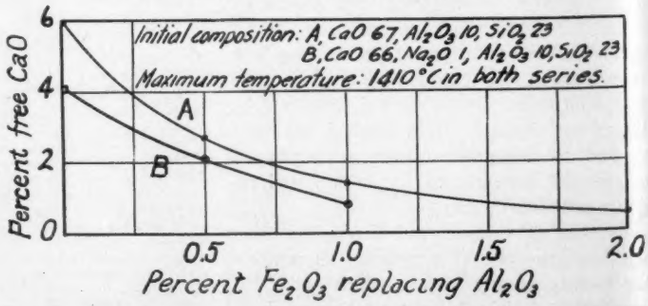

Initial composition: A, CaO 67, Al_2O_3 10, SiO_2 23
B, CaO 66, Na_2O 1, Al_2O_3 10, SiO_2 23
Maximum temperature: 1410°C in both series.
A
B
Percent free CaO
Percent Fe_2O_3 replacing Al_2O_3

Fig. 13. Effect on combination of CaO due to replacement of Al_2O_3 by Fe_2O_3, "A" in the absence and "B" in the presence of Na_2O

in the charges were 5.3 and 5.0, respectively.

The increase in combination, as shown by the decrease in free-lime content which results through an increase in the temperature of burning, is shown in Table II. A maximum temperature of about 1500 deg. C. is required to effect complete combination of lime, alumina and silica, in the composition given, and under the manner of heating used in the present study.

TABLE II—INFLUENCE OF TEMPERATURE ON COMBINATION OF CaO
(Composition: CaO 67, Al_2O_3 10, SIO_2 23%)

Temperature of Heating Thermocouples				
No. 4* Deg. C.	No. 3† Deg. C.	No. 2† Deg. C.	No. 1† Deg. C.	Free CaO Percent
1160	1350	1330	1320	8.2
1140	1380	1380	1320	7.5
1160	1410	1410	1360	5.8
1160	1420	1420	1360	3.9
1330	1500	1475	1450	0.0

* ±20 deg. C. † ±10 deg. C.

Figs. 4 to 13, inclusive, show the effects on the combination, as revealed by the free-lime content, resulting from the replacement of magnesia, soda or potash for calcium oxide, and ferric oxide for alumina, in amounts up to 5%. These effects are shown both singly and in combination. The initial composition is given in each case, so that the exact composition of any point on the curves may easily be ascertained. The maximum temperatures also are given, and the temperatures at each thermocouple for all samples are listed in Table III.

TABLE III—TEMPERATURES MEASURED AT FOUR THERMOCOUPLES OF ALL SAMPLES ILLUSTRATED IN FIGURES 4 TO 13

Figure	Temperature of Heating Thermocouples Deg C. No. 4*	Deg. C. No. 3†	Deg. C. No. 2†	Deg. C. No. 1†
4	1160	1350	1330	1320
5	1160	1410	1410	1360
6 and 7	1200	1415	1425	1390
8	1160	1340	1315	1300
9	1200	1410	1400	1400
10	1000	1275	1270	1230
11	1080	1315	1290	1265
12	1090	1305	1300	1290
13A	1160	1410	1410	1360
13B	1140	1410	1400	1340

* ±20 deg. C. † ±10 deg. C.

Effect of replacing calcium oxide by magnesia (Fig. 4) and alumina by ferric oxide (Fig. 5). A decrease in free lime is noted. The samples containing magnesia were burned at a lower temperature than those containing ferric oxide. The curves show that small percentages of ferric oxide replacing alumina, and of magnesia replacing lime, aid materially in effecting combination of the lime. The magnesia is decidedly more effective than the ferric oxide in this composition, as it will be observed that about 4% of magnesia replacing lime brings about complete combination at a temperature of 1350 deg. C., while 4% of ferric oxide replacing alumina brings about complete combination only at the higher temperature of 1410 deg. C. Hence it is shown that 4% of ferric oxide caused complete combination of lime at a temperature 100 deg. C. lower than was required for the sample without ferric oxide, and, 4% magnesia effected complete combination at a temperature 150 deg. C. lower than was required for the sample without magnesia.

[7] A similar conclusion with respect to the influence of alkalies was reached by S. B. and W. B. Newberry, *J. Soc. Chem. Ind.*, 16, 887 (1897).

Effects of small amounts of potassium oxide (Fig. 6) and sodium oxide (Fig. 7). It is apparent that these oxides have no especial value in increasing the combination of lime in this composition.[7] They do, however, increase the amount of liquid present during burning to a very marked degree, as was shown by an examination of the resulting products. There was distinctly increased fusion with increased potash or soda content. The potash and soda contents of the samples, as given on the abscissas, were the amounts of potash or soda contained in the original samples. Some of this is undoubtedly volatilized during the burning. It is observed that up to 0.5-1.5%, increasing potash and soda, respectively, favor combination of the lime, but above 0.5-1.5% a reversal occurs, indicating that additional alkali above this amount decreases the combination.

The validity of the data on the effect of soda and potash is indicated by work previously reported by Lerch and Bogue.[8] They showed that the presence of soda in a synthetic laboratory cement in the amount of 2.29% after burning gave a negative test with the ammonium acetate method for free lime, and also that commercial cements known to contain combined alkalies, but no free lime, reacted negatively. This may be regarded as evidence that the values for free lime obtained and reported herewith are actually a measure of this component, and are not vitiated by the presence of the alkalies combined in the material. However, because of the unusual reversal in direction of these alkali curves, a further test was made. A sample containing 2% soda was prepared, burned and titrated for free lime in the usual way. The free lime content was found by this method to be 3.1%. The solution was then filtered off and the total calcium oxide in the filtrate determined gravimetrically by precipitation with ammonium oxalate. The content of lime by this method was found to be 3.0%. Since the two values are essentially the same, it is shown that the values obtained by the titration method are essentially correct even in the presence of combined alkalies in the product.

The explanation of the reversal is not clear, but it seems probable that the soda may combine with silica or alumina in a different ratio than does lime. For example, a given weight of soda may combine with a larger amount of silica or alumina than does the same weight of lime. Then, on replacing lime with soda, gram for gram, as was done in these experiments, the material (silica or alumina) available for combination with the lime would be decreased with each portion of soda added and the result would be analogous to the addition of more and more lime to the mixture.

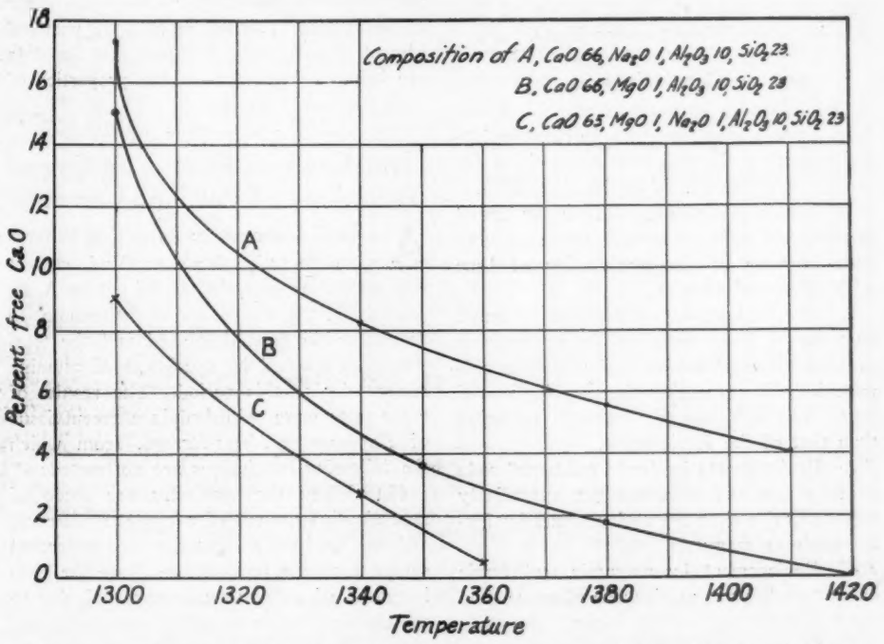


Fig. 14. Effect of combination of CaO due to variation in burning temperature

Effect of magnesia when sample has 1% lime replaced by 1% soda (Fig. 8) and of ferric oxide on same composition (Fig. 9). It is evident again that magnesia is more effective than ferric oxide in this composition. The samples containing magnesia were burned at a temperature 70 deg. C. lower than those containing ferric oxide.

By a comparison of Figs. 4 and 8 it would appear that, if we wish to maintain the percentage of lime as high as possible, the presence of soda offers no advantage, as the influence of magnesia and ferric oxide appears to be as great alone as in the presence of soda.

Effect of ferric oxide when samples contain 5 and 3%, respectively, of magnesia and 1% of soda (Figs. 10 and 11). The samples containing 5% magnesia were burned at a temperature 40 deg. C. lower than those con-

taining 3% magnesia. The 5% samples contain a greater amount of free lime and would require for complete combination about the same temperature as was used with the 3% samples. It will be observed that the percentage of free lime in both series decreases rapidly as ferric oxide is added, up to about 3% ferric oxide. There is little change beyond that point.

Effect of ferric oxide when sample contains 3% magnesia and no soda (Fig. 12). A comparison of this curve with Fig. 11 shows that soda has very little influence in increasing the combination of the lime in the presence of magnesia.

Fig. 13 shows that soda aids slightly in the combination of lime in the absence of magnesia when small amounts of ferric oxide are added.

Fig. 14 shows the effect of increasing temperature upon the combination of the lime in three different compositions.

Conclusions

The following conclusions may be drawn from these studies, but may be construed to apply only to the one base composition investigated—CaO 67, Al_2O_3 10, SiO_2 23%.

1. The replacement of lime by small amounts of soda or potash produces very little increase in the combination of lime with silica and alumina.

2. The replacement of alumina by small amounts of ferric oxide or the replacement of lime by small amounts of magnesia aids materially in promoting the combination of lime. The influence of magnesia is greater than that of the ferric oxide.

3. Replacements by ferric oxide and soda or magnesia and soda are not appreciably more effective than are replacements by ferric oxide or magnesia.

4. Replacement by magnesia and ferric oxide together are much more effective than are replacements by either alone.

5. In order to obtain the greatest decrease in the temperature required for complete combination with the least change in the original composition, the optimum mixture seems to be one in which 3% each of magnesia and ferric oxide have replaced an equal amount of lime and alumina, respectively.

6. A composition of CaO 67, Al_2O_3 10, and SiO_2 23% requires, under the conditions of this study, a temperature of 1500 deg. C. to effect complete combination.

7. A composition of CaO 63, MgO 3, Na_2O, Al_2O_3 7, Fe_2O_3 3, SiO_2 23%, which approaches the composition of commercial portland cement, requires a temperature of about 1325 deg. C. for complete combination under the conditions of these experiments. This is a decrease of 175 deg. C. below the temperature required for the base composition.

8. The common belief that any material that will cause an increase in the amount of liquid formed in such a system, at a given temperature, will likewise cause an increase in the combination of lime is true in this composition for magnesia and ferric oxide, but to a very limited extent for soda or potash. The charges containing these latter oxides were distinctly more fused than the ones without them, but no great increase in combination was effected by their presence. A possible explanation is given.

It is not the aim of the paper to show that ferric oxide, magnesia or the alkali oxides are desirable or undesirable in portland cement except in that they lower the temperature at which a certain base composition can be burned to complete combination. This base composition (CaO 67, Al_2O_3 10, SiO_2 23%) approaches the average composition of portland cement when the several components are referred to the oxides of lime, alumina and silica. Furthermore, these data indicate nothing at all with respect to any other base composition, and it is not permissible to assume similar effects for other compositions. The entire field of portland cement is now being explored and the data are being correlated with the properties of the products in service.

Heat Changes During Setting of Alumina and Portland Cements

ALUMINA cement in its setting behaves so differently from portland cement that tests were recently carried out by A. A. Jakkula of the University of Minnesota, to determine the heat developed and the temperatures reached by specimens of alumina cement during this period. The results of these tests were published in a recent issue of *Engineering News-Record,* from which the following conclusions are abstracted:

(1) When the specimens are made of neat alumina cement of average consistency, and are confined so that the heat generated cannot escape, a temperature above the boiling point of water may be expected, due to the chemical action of setting and hardening.

(2) A decrease in the richness of the mix reduces the temperature rise.

(3) Indications reveal that the alumina cement specimen reached a temperature four times that of a similar portland cement specimen.

(4) The rise in temperature with alumina cement takes place very suddenly. In every instance a rise of over 100 deg. F. took place in approximately 15 minutes.

(5) A high initial temperature causes quick setting of an alumina cement mix.

(6) In all cases, for the same mix and the same water-cement ratio, the specimens composed of alumina cement generated over twice as much heat as similar specimens of portland cement.

(7) At initial temperatures below 80 deg. F. the temperature of a concrete using alumina cement will start to rise in about five hours.

While the test runs were not sufficient in number to justify any sweeping statements as to the behavior of alumina cement during setting, the above conclusions were supported by the tests.

Relative Value of the Various Agricultural Lime Products*

By Dr. A. B. BEAUMONT
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THREE fundamental questions will be considered and answered.

First question: Shall the farmer choose caustic or carbonate forms of lime?

There is sufficient experimental evidence to justify the conclusion that from the agronomic standpoint one form is as good as another, provided the carbonate forms be sufficiently finely ground. The question of minimum requirements in this respect will be referred to later.

While there is no occasion for choosing one chemical form instead of another from the standpoint of the crop, there may be justification from the standpoint of the hired man. There is no doubt that under some conditions the caustic forms are intolerable for the workman.

Second question: To what extent may magnesium lime materials be used?

The old bugaboo of the necessity of a definite calcium-magnesium ratio in the soil has been killed. Experimental results from Rhode Island, New Jersey, Ohio and Tennessee show that there is little or nothing to be feared from the use of lime materials containing no more than 25-30% MgO. At Rhode Island best results were secured with onions and soybeans with a hydrate containing 33.1% MgO. For several reasons, the writer thinks it is safe to use lime materials carrying MgO equal to, but not exceeding, the percentage of CaO. This would include pure dolomite.

So long as there is no greater charge for a unit of MgO than for a unit of CaO, the farmer profits, because the neutralizing value of MgO is 1.4 as compared with 1.0 of CaO. Also, certain nutritional disturbances may be avoided by the use of magnesian materials.

Third question: How finely must limestone be ground to be effective?

There is considerable evidence that limestone ground finely enough to pass a 10-mesh sieve and containing all the fine material incident to grinding is fine enough for general farm rotation of four or five years. Hartwell of Rhode Island has shown that 80-mesh material is as effective as hydrate, the first year, and that it is the proportion of material of that fineness which measures the immediate effectiveness of ground limestone. Our Massachusetts standard requirement that all particles pass a 20-mesh sieve is entirely sound and conservative.

Effective Oxides.—The only way in which any one farmer may arrive at a fair decision as to choice of materials is by figuring the cost of a definite number of pounds or units of effective oxides when finally spread on the land. In doing this, cost at the plant, freight charges, hauling and spreading costs should be considered.

*Paper read at the First New England Lime Conference, Amherst, Mass., July 13, 1927. (See ROCK PRODUCTS, August 6, 1927.)

Evolution of the Gypsum Wallboard

A Review of American Patent Literature on Gypsum Wallboard Manufacturing Processes and Types

By Joseph Rossman
Washington, D. C.

A PIECE OF wallboard may not appear to be a very significant invention to the ordinary person today. Its structure is very simple, involving nothing else but a slab of plaster of paris covered with paper, yet as in many other important inventions the result seems quite obvious once it is produced. The materials which are used to make plaster boards have been known for hundreds of years. The preparation and properties of plaster of paris were known by the ancient Greeks. About 2200 years ago, Theophrastus described the occurrence and some of the properties of gypsum, stating that it was employed as a cement, for building exteriors and for making interior ornaments and statues. He described also the calcination of gypsum and its setting with water. In 1768 Lavoisier showed that the hardening of gypsum is a result of its recombining with the water of crystallization from which it had been deprived by heat. Paper has also been known for many centuries and the Chinese practiced paper making at a very distant period. The inventive step of uniting these two well known materials, however, did not occur until only comparatively recent times.

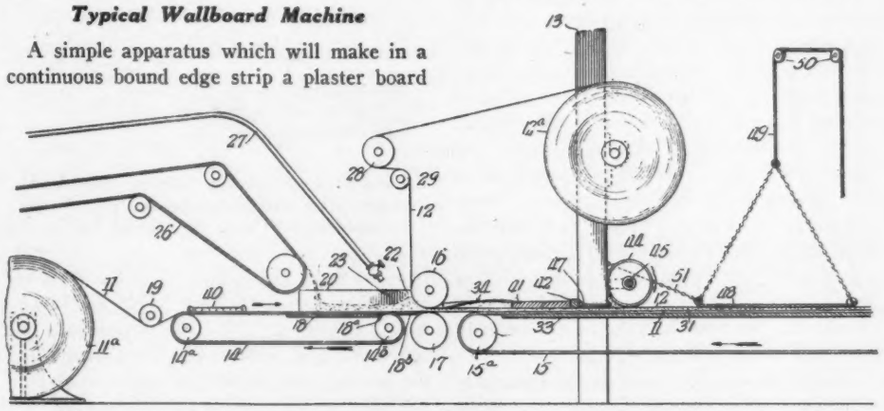
Pioneer Patents

One of the earliest patents on a plaster board was granted in 1889 to Alfred Paris, who formed blocks of plaster of paris covered with burlap or other fibrous material. The blocks were molded about 32 in. long or of sufficient length to reach across two spaces between joists or studs. to which they were secured by nails at the ends and middle, without the use of lath or any other combustible material. Paris recognized that the blocks were fireproof and could replace the lath and expensive plastering operations. He also suggested the use of thin sheets for background and sliding screens of theatrical scenic representations on the stage. Paris seems to be the first to suggest the varied and possible uses of plaster board as it is used today. Many patents have since been granted on plaster boards. The usual plaster board of today has paper cover sheets instead of the burlap of paris.

The use of paper in the continuous production of plaster board involved a great difficulty in the handling of the moist plaster board. The moisture from the plaster mix saturated the cover sheets so that it was very difficult to handle the board without tearing it. Schumacher solved the difficulty by using paper sheets which were sized to retard permeation by moisture. His patent (1,176,322) for this process has been sustained as valid in the courts since it was a decided improvement in plaster board manufacture enabling the efficient and continuous process of manufacture.

Typical Wallboard Machine

A simple apparatus which will make in a continuous bound edge strip a plaster board consisting of top and bottom coverings of paper and of an intermediate layer of plaster material to which the said covering sheets are adhered, the margins of the bottom sheets being turned over upon and inclosing the margins of the top sheet, which margins are adhered together through the medium of the plaster body between them is shown in Fig. 1, which represents diagrammatically a longitudinal section through the apparatus. The wider bottom covering sheet is indicated at *11* and *12* indicates the narrower top covering sheet of the finished board. Each of these sheets is fed from a roll, one of the rolls *11a* being mounted on a base or on the floor below the apparatus, and the other, *12a*, mounted on suitable posts or uprights *13* rising at the sides of the apparatus. The bottom sheet *11* in its continuous advance through the apparatus, is supported by suitable endless belts *14* and *15*, the first being located near the roll of paper *11a* and at the rear of the spreading rolls shortly to be referred to, and the other, *15*, being located more remote from the paper roll and in front of said spreading rolls.



The modern wallboard machine bears little resemblance to the early type shown here but on examination of the sketch, it will be found that the essentials of design remain unchanged and are merely modified and refined

The belt *14* is mounted on longitudinally spaced rolls *14a* and *14b*, and the belt *15* on similar spaced rolls *15a* and a second roll which is not shown in the drawings. Between the rolls *14b* and *15a*, there are a pair of spreading rolls *16* and *17* which are spaced apart a distance equal to the total thickness of the board to be made. The bottom roll *17* is located with its top surface in the plane of the top laps of the two belts *14* and *15*. This roll is mounted in a fixed bearing, while the upper roll is mounted in vertically adjustable bearings, so that it is capable of a vertical thickness of the board.

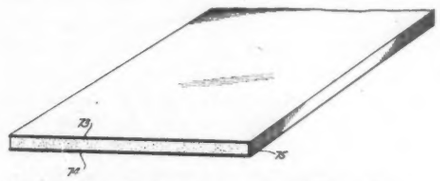
At the rear of the spreading rolls a platform *18* extends from the bottom spreading roll *17* to a space some distance to the rear of the said roll. This platform *18* has its top surface in a plane tangential to the top of the roll *17* and is made wider transversely than the belt *14*, the top lap of which passes through a transverse slot *18a* in the forward end of the board.

The bottom sheet thus advances from the supply roll *11a*, over the top lap of the belt 14, over the part *18b* of the platform *18*, forward of the belt, over the bottom spreading roll *17* and thence to the top lap of the belt *15*. A tension roll 19 is preferably provided intermediate the belt *14* and the supply roll *11a*.

At each side of the platform *18* and projecting into the space between the spreading rolls *16* and *17*, are mold boards *20*, which determine the width of the plastic body to be included between the layers of paper, and extend parallel to each other in the direction of the feed of the paper. They are

mounted with their bottom edges a distance above the top surface of the platform *18*, sufficient to permit the thickness of the bottom sheet to pass underneath them, and are secured to the platform by means of overhanging brackets attached to its edges.

The forward ends *22* of the mold boards *20* are offset inwardly, that is to say, toward each other, from the plane of the main length of the boards, the forward ends *22*

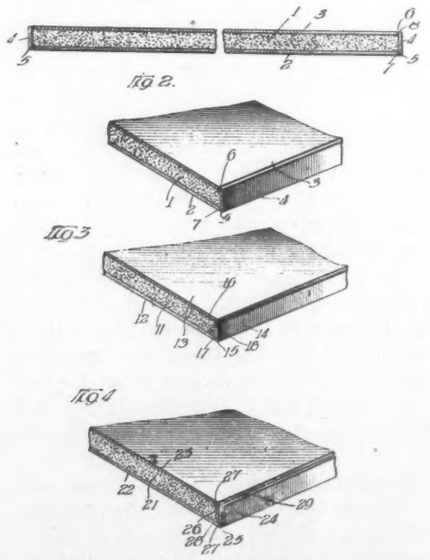


The simplest form of wallboard—a plaster core between covering sheets (U. S. No. 1,352,390)

being connected to the main lengths by means of inwardly inclined parts *23*. The top edges of the forward ends *22* are curved so that they may be made to closely engage the paper of the top sheet when it passes around the top roll, as will presently appear.

The plastic mix is discharged upon the advancing bottom sheet *11* by means of a belt conveyor *26* suitably supported above the platform *18* from a hopper (not shown). A water pipe *27* is arranged to discharge water upon the plastic mix on the bottom sheet, in case more water is required than has already been put into the mix when it is delivered to the belt conveyor.

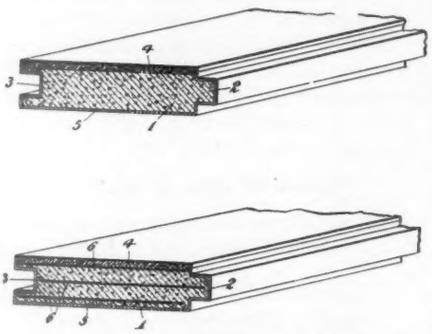
Operatives on either side of the apparatus mix and roughly spread the plastic mixture over the bottom sheet and remove any hard particles that may have set and have become detached from the mold boards, after first adhering thereto. As the bottom sheet advances toward the spreading rolls, the plastic mix is crowded toward the center and



A type in which the lower cover sheet is folded over the edge so as to be flush with the outer face of the other sheet (U. S. No. 1,395,031)

is edged up by the mold boards and is dammed up against the spreading rolls, at the same time leaving the marginal parts of the bottom sheet which project beyond the mold boards, free of the plastic mix.

The top sheet *12* is fed from its supply roll *12a* and then about the tension rolls *28*, *29*, and then downwardly and forwardly about the upper spreading roll *16*. After the top sheet is applied, the plastic body is spread evenly as it passes over the top sheet and the bottom sheet between the spreading rolls, so that as the three parts comprising the board approach the common vertical diametric plane of the spreading rolls, the board



Tongue and groove edges; the body comprising different layers of plaster material (U. S. No. 1,491,112)

is in the form of a bottom sheet having marginal parts on which there is no plastic material, extending beyond a plastic body on the sheet, and with a top sheet applied to the plastic body having its edges projecting slightly beyond the same. By having the top roll *16* somewhat shorter than the width of the top sheet, the plastic mix is prevented from collecting on the ends of the roll and hardening thereon.

After the board passes the spreading rolls, the marginal parts of the bottom sheet with the small amount of plaster spread out thereon are turned over to embrace the top sheet by means of folding horns.

A table *33* is located forward of the roll *15a* (which supports the rear loop of the endless belt *15*) with its surface in supporting engagement with the top lap of the belt *15*. The table is wider transversely than the belt, and is somewhat wider than the bottom sheet of the plaster board. At each side of the plaster board are mounted folding horns *34* of familiar construction, which are mounted on an overhanging block at the sides of the board *33*. As the board is drawn forward, the marginal parts of the bottom sheet are caught by the rear ends of the horns and the margins with the plaster *30* are bent or turned over upon the top sheet.

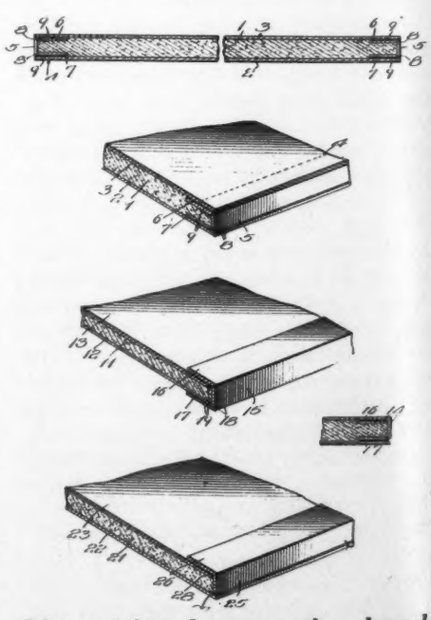
After leaving the rolls *44*, the board is passed under a weighted ironing or smoothing member *48*. This is in the form of a plate which may be attached to cable *49* passing over pulleys *50*, so that it may be lifted out of the way when threading the machine. The ironing or smoothing member is wider than the plaster board, so that it extends beyond both edges of said board. It is prevented from advancing and moving forward with the board by means of chains *51* which are attached to the upright posts *13*. The ironing member, as the name applied to it suggests, irons out and smooths any wrinkles or buckles that appear or tend to form in the plaster board, and finally flattens the board and adheres the paper sheets to the plastic layer as the plastic layer approaches or reaches a set condition. The board is then dried in suitable kilns.

Types of Wallboard Improvements

The improvements relating to wall boards may be gathered into several distinct groups. The first group embraces the various methods of reinforcing the edges to prevent cracking when nailed. The second group contains the means used to prevent the peeling of the liners. The third group outlines the different methods of reinforcing the core of the plaster board. The fourth group deals with the various edge construction such as tongue and groove, lap edges, etc. The fifth group relates to the different ways of waterproofing plaster boards. The sixth group deals with the production of a lightweight plaster board. Another large field embraces the various plastic compositions which may be suitable for plaster board manufacture. This feature will not be discussed here; only the above numerated groups will be briefly discussed.

1. Edge Reinforcement

It has been found that the edges of the plaster board tend to crack when nailed to the studding, and many efforts have been made to overcome this by reinforcing the edges. One of the early patents granted to Roberts (985,207) used rope or twine in the edges of the plaster board. Since then patents have been granted for reinforcing the



Edge reinforced type — the channel-shaped edge binder is inserted in the edge of the board (U. S. No. 1,395,032)

edges with strips of paper or by using a nail penertable plastic mixture at the edges. The edges have also been reinforced by externally reinforcing them with strips of paper.

II. Prevention of Peeling

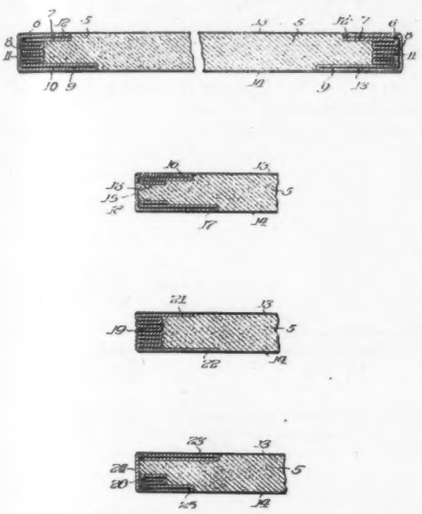
Various expedients have been used to prevent the peeling of the cover sheets. For instance, the cover sheets have been roughened or napped so as to insure adhesion to the plaster. Various adhesives have also been used, such as gum arabic.

III. Core Reinforcement

The core of the plaster board has been reinforced by sheets of paper, fabric, wire and perforated metal sheets as well as with dispersed fibers.

IV. Edge Construction

When an interior wall is built from plas-



Edge reinforcing by means of folded strip of paper imbedded in the edge (U. S. No. 1,508,638)

ter boards, the abutting edges must be made as inconspicuous as possible. Many different edges have been designed to accomplish this. The edges may be rounded so as to receive a key of plaster or they may be interlocked by tongue and groove joints.

V. Waterproof Boards

When wall board is used on the outside of buildings or where it is subjected to moisture it must be waterproofed. Tar paper has been used as cover sheets. Sometimes the entire board may be immersed in asphalt. A laminated paper sheet may be used having asphalt between the layers.

VI. Lightweight Boards

In order to lighten the weight of wall boards various fillers have been used with the plaster, such as sawdust. Porous wall boards have also been made by producing voids in the core by using excess water in the plaster mix, casein compounds, or through other chemicals.

The United States patents relating to these groups have been briefed and are given in chronological order. These abstracts will give a vivid picture of the development of wall board and the solution of the many problems encountered in its manufacture. The wallboard industry is one that has been entirely developed by Americans and is very characteristic of the American spirit in producing new and efficient industrial methods. The foreign patents that have been granted on plaster boards are practically negligible.

Abstracts of United States Patents

1. *Paris, 401,967, April 23, 1889.* A block of plaster of paris composition covered with burlap adapted to be nailed to studding and then treated with a finishing coat.

2. *Mowry, 513,710, January 30, 1894.* A compo-board having finely divided wood commingled with cement, longitudinal wooden strips for nailing purposes and paper board facings adhering to the flat surfaces.

3. *Sacket, 520,123, May 22, 1894.* Webs of paper sheets are treated with pitch and alternated with layers of plaster to form a board.

4. *Ryan, 649,363, May 8, 1900.* Layers of paper and plaster united into a board. The paper is formed with perforations into which the plaster may extend.

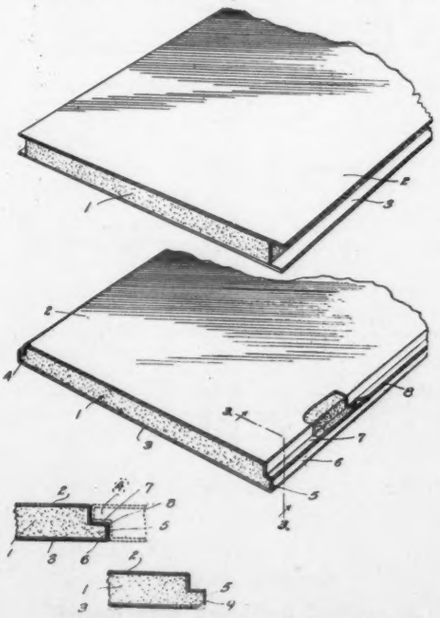
5. *Roberts, 783,544, February 28, 1905.* A board composed of cement, stucco and fiber, a tarred paper attached to one face and a burlap fabric attached to the other face.

6. *Kimmet, 820,793, May 15, 1906.* A plaster board having two layers of plastic cement and shale, an intermediate layer of straw and cement and a layer of burlap secured to one face of the board.

7. *Rader, 884,954, April 14, 1908.* A plaster board having a core of plaster of paris and fibers covered with a sheet of paper united to the core by means of projections formed in the paper sheet.

8. *Jones, 886,813, May 5, 1908.* Blocks formed of alternate layers of plaster and reinforcing strips of burlap. The burlap is molded between the layers of plaster before it is set. The blocks are stepped at opposite edges.

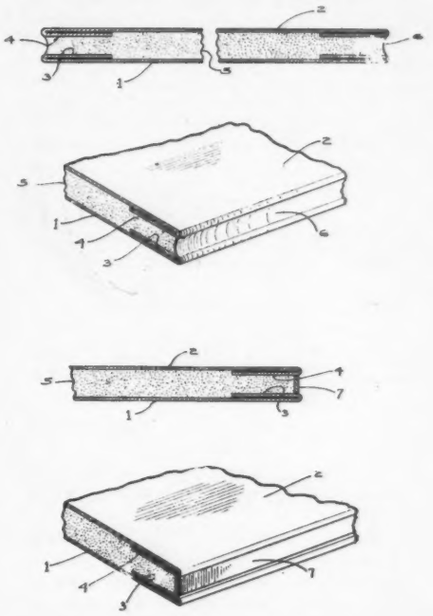
9. *Rader, 891,440, June 23, 1908.* A plaster core is covered with paper or felt having



Wallboard with lap tongues at its edges (U. S. No. 1,575,842)

the inside face napped or roughened so as to insure adhesion to the core.

10. *Kelley, 905,191, December 1, 1908.* A plaster board consisting of an outer layer of fibrous material, a layer of paint and a layer of hard plastic material, the layer of paint being disposed between and acting to



Margins of cover sheets turned back on themselves and flat paper strip pasted on edges (U. S. No. 1,526,307)

intimately bind together the fibrous layer and the plastic layer.

11. *Papin, 906,654, December 15, 1908.* An imitation tile having a backing of paper to which a layer of plaster of paris is applied and a facing of glazing adhering to the plaster of paris layer.

12. *Fishack, 911,223, February 2, 1909.* A plaster board having a corrugated fabric reinforcement embodied in the body. One of the cover sheets is indented at intervals to receive a coating of plaster.

13. *Friedman, 912,664, February 16, 1909.* A plaster board comprising a plurality of alternated layers of plaster, and fibrous sheets, and a plurality of parallel independent strips of a flexible mesh embedded in said plaster cement, and spaced apart from each other whereby said board may be cut into strips each having a reinforcement thereon, and a facing sheet of asbestos paper.

14. *Bell, 932,098, August 24, 1909.* A plaster board having a porous core consisting of a mixture of plaster and loose comminuted paper.

15. *Rowe, 937,869, October 26, 1909.* A paper covered plaster board having a core of ground corn cobs and plaster of paris reinforced with hemp fibers.

16. *Roberts, 985,207, February 28, 1911.* The usual paper covered plaster board is provided with strands of rope or twine embedded in the edges and at points where nails are usually driven to prevent cracking.

17. *Utzman, 1,034,746, August 6, 1912.* A plaster board is completely covered with paper. The core is reinforced longitudinally through its entire width with paper sheets.

18. *Schumacher, 1,176,322, March 21, 1916.* The paper cover sheets are sized to retard permeation by moisture during the manufacture of the plaster board.

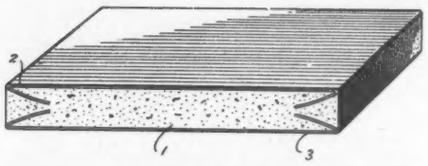
19. *Simonson, 1,256,384, February 12, 1918.* A board consisting of cement, sand and rice

husks mixed together with one or more layers of woven bamboo strips embedded therein.

20. *Armstrong, 1,278,821, September 17, 1918.* A plaster board having laminated cover sheets. The inner plies adjacent the plaster are unsized and the outer plies are sized.

21. *Armstrong, 1,322,278, November 18, 1919.* The ordinary plaster board is immersed in a bath of asphalt and a layer of crushed stone is applied to one face.

22. *Sexton, 1,325,883, December 23, 1919.* A plaster board having waterproofed facing sheets. The board is heated to soften the waterproofing so as to allow the waterproof-



Margins of cover sheets turned back into plaster core (U. S. No. 1,576,142)

ing to permeate the plaster body and the sheet.

23. *Utzman, 1,330,413, February 10, 1920.* A completely covered plaster board having beveled edges.

24. *Martinet, 1,333,553, March 9, 1920.* The ordinary plaster board is provided with pasteboard strips embedded in the core at intervals. Metal washers having openings for nails are secured to the strips at intervals.

25. *Schumacher, 1,333,579, March 9, 1920.* The edges of the plaster board are waterproofed and hardened by a sizing or cement glue to prevent chipping during transportation and handling.

26. *Orlando, 1,333,820, March 16, 1920.* Blocks of cement are secured to a lath framework consisting of a plurality of longitudinally arranged and spaced lath strips. Spaces are provided between the blocks for nailing purposes.

27. *Robinson, 1,344,962, June 29, 1920.* The usual plaster board is reinforced with wire netting and the paper cover sheets coated with cellulose acetate.

28. *Armstrong, 1,347,487, July 27, 1920.* A completely covered plaster board. The lower cover sheet is folded around the edges of the board and is perforated at the margins to secure good adhesion to the plaster.

29. *Birdsey, 1,358,508, November 9, 1920.* The marginal edges of the cover sheets are folded into the middle portion of the edge, giving a completely covered board.

30. *Armstrong, 1,367,292, February 1, 1921.* A plaster board having rounded edges.

31. *Winterrath, 1,369,151, February 22, 1921.* To a backing of heavy burlap a layer of plastic material is applied; a facing sheet of muslin is then applied which is finished with enamel or celluloid paint.

32. *Schumacher, 1,376,784, May 3, 1921.* A plaster board covered by a single sheet of paper, the overlapping edges of which are glued together.

33. *Utzman, 1,383,249, June 28, 1921.* A completely covered plaster board. One of the margins of the cover sheet is embedded in the plaster.

34. *Birdsey, 1,383,254, June 28, 1921.* The lower margin of the cover sheet is folded over the edge of the plaster board.

35. *Birdsey, 1,384,298, July 12, 1921.* The top cover sheet margins are embedded in the body of the plaster board.

36. *Birdsey, 1,395,031, October 25, 1921.* The lower cover sheet of a plaster board is

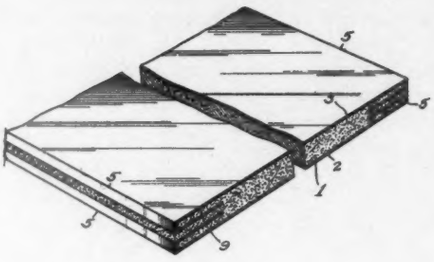


Fig. 2

One of the newer forms of edges—the margins of the cover sheets folded over the edge faces and again into the core (U. S. No. 1,642,840)

folded over the edge so as to be flush with the outer face of the other cover sheet.

37. *Birdsey, 1,395,032, October 25, 1921.* A channel shaped edge binder is inserted in the edge of the plaster board.

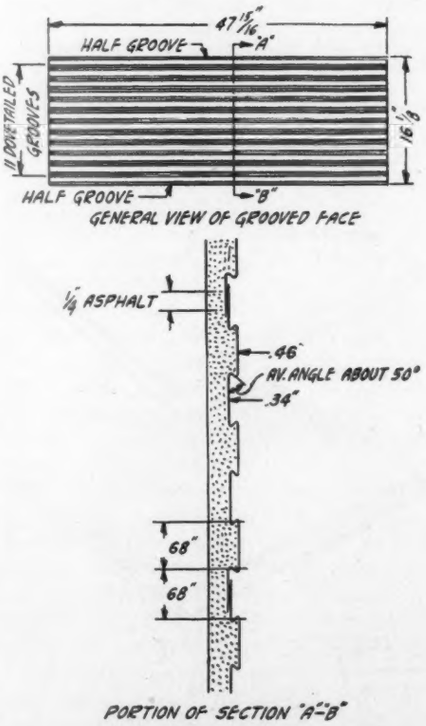
38. *Armstrong, 1,399,455, December 6, 1921.* A corrugated plaster board having facings of tar paper and a core of plaster and asphalt.

39. *Birdsey, 1,406,967, February 21, 1922.* A single sheet covers the entire plaster board. The abutting inner edges of the sheet are sealed with a strip.

40. *Lockhart, 1,423,569, July 25, 1922.* A wall board composed of plaster of paris, lime and shredded wood fibers. The fibers produce a roughened surface.

41. *Birdsey, 1,427,939, September 5, 1922.* The folded-over margin of the plaster board terminates short of the other cover sheet.

42. *Birdsey, 1,428,624, September 12, 1922.* The board is similar to patent 1,406,697 ex-



A grooved wallboard with asphalt treated covering sheets (U. S. No. 1,645,598)

cept that the sealing strip is on the outside of the board.

43. *Brookby, 1,428,827, September 12, 1922.* A wall board having cover sheets with layers of calcined gypsum bonded thereto and a core of diatomaceous earth mixture therebetween.

44. *Emerson, 1,439,954, December 26, 1922.* Cotton gauze is embedded in the faces of a plaster board which contains a stearic compound to waterproof it.

45. *Schumacher, 1,440,633, January 2, 1923.* A plaster board having a single sheet of paper folded to cover both faces of the core and folded back upon itself and embedded in the body.

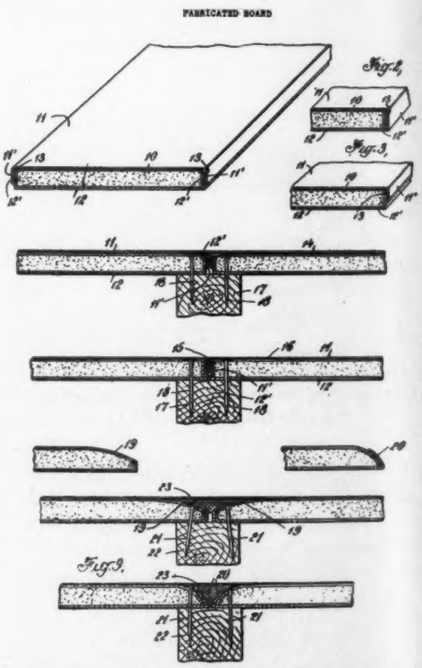
46. *Dunston, 1,445,204, February 13, 1923.* A slab having a body of clay, chalk, slimes, long vegetable fibers, silicate of soda, calcium chloride and iron oxide, having an outer cement coating and an inner finishing coat of plaster of paris.

47. *Armstrong, 1,445,813, February 20, 1923.* A plaster board having an edge insert having perforated folded margins contacting with the cover sheets.

48. *Dorn, 1,450,582, April 3, 1923.* A composition plaster board having two or more embedded layers of straw extending at an angle with each other.

49. *Jensen, 1,456,599, May 29, 1923.* A plaster board having a perforated metal sheet embedded therein.

50. *Routt, 1,459,264, June 19, 1923.* The



A new type of board with beveled edges (U. S. No. 1,638,280)

facing sheets are adhered to the moist plaster core with a dry adhesive.

51. *Walper, 1,474,657, November 20, 1923.* A plaster board having absorbent paper facings. A plurality of sheets may be used having asphalt between the layers.

52. *Armstrong, 1,475,674, November 27, 1923.* The lower cover sheet is folded over the edge of the plaster board. A strip seals the joint between the margins of the upper and lower cover sheets.

53. *Brookby, 1,489,693, April 8, 1924.* A plaster board having the usual plaster core provided with a composition along the edges containing a colloidal gummy body to produce hard and tough edges.

54. *Spink, 1,491,112, April 22, 1924.* A plaster board having tongue and groove edges. The body is made up of different layers of plastic material.

55. *Utzman, 1,492,588, May 6, 1924.* The margins of the cover sheets are folded over the edges of the board. The margins have feathered edges.

56. *Emerson, 1,497,261, June 10, 1924.* A plaster board having waterproof facings. The top cover sheet extends beyond the edge of the board.

57. *Haggerty, 1,500,452, July 8, 1924.* A paper covered plaster board having a core made from a composition of plaster of paris and boiled starch.

58. *Walper, 1,502,603, July 22, 1924.* A wall board having a composition of crushed rough asbestos and calcined gypsum, and having a surface layer of coarse calcined gypsum.

59. *Ringholz, 1,507,893, September 9, 1924.* A plaster board reinforced with a metal sheet having projections.

60. *Jenkins, 1,508,658, September 16, 1924.* The edge of the plaster board is reinforced with a folded strip of paper embedded in the edge.

61. *Brookby, 1,511,500, October 14, 1924.* A porous plaster board made by incorporating excess water in the plaster which upon evaporating leaves voids.

62. *Morreale, 1,514,561, November 4, 1924.* A wall board composed of strips of wire mesh embedded in plaster, and cross wires arranged with reference to the wire mesh and coverings for the strips to secure them in proper relation.

63. *Birdsey, 1,515,380, November 11, 1924.* The edges of the plaster board are covered with an L-shaped strip.

64. *Williams, 1,519,180, December 16, 1924.* The margins of the cover sheet are folded over the edges of the plaster board short of each other. The margins are feathered.

65. *Birdsey, 1,525,715, February 10, 1925.* The margins of the cover sheets overlap at the edges of the plaster board.

66. *Birdsey, 1,526,307, February 10, 1925.* A flat paper strip is secured to the edges of the board. The margins of the cover sheets are turned back upon themselves.

67. *Haggerty, 1,539,183, May 26, 1925.* The overlapping edges of the cover sheets are united by a casein or silicate of soda adhesive at the edges of the board.

68. *Utzman, 1,540,045, June 2, 1925.* The top cover sheet has chamfered edges and the lower cover sheet is folded over the edges of the board and embedded in the upper face.

69. *Comerma, 1,555,555, September 29, 1925.* A completely covered plaster board having longitudinal reinforcing strips at the edges.

70. *Schumacher, 1,556,163, October 6, 1925.* Corrugated paper strips embedded in the edges of the board.

71. *Birdsey, 1,561,635, November 17, 1925.* The cover sheet margins are folded over the side edges and terminate short of each other.

72. *Ritchie, 1,564,625, December 8, 1925.* A plaster board having laminated cover sheets of plain paper and an inner sheet of asphalt paper. Upon heating the board the asphalt permeates all the sheets.

73. *Johnston, 1,575,842, March 9, 1926.* A plaster board having lap tongues at its edges.

74. *Schumacher, 1,576,141, March 9, 1926.* A plaster board having retarded plaster adjacent the cover sheets to insure adhesion and a body of quick setting plaster.

75. *Schumacher, 1,576,142, March 9, 1926.* The margins of the cover sheet are bent into the body at the board edges.

76. *Armstrong, 1,578,250, March 30, 1926.* A plaster board is provided with nailing strips at its edges made from a plastic nailing mixture composed of tar, sawdust or other fibrous material and clay, mixed while hot.

77. *Schumacher, 1,583,187, May 4, 1926.* The edges of a plaster board are reinforced with a paper strip having protruding portions embedded in the plaster.

78. *Schumacher, 1,584,148, May 11, 1926.* A completely covered plaster board having tongue and groove edges.

79. *Schumacher, 1,584,663, May 11, 1926.* The marginal portions of the cover sheets are serrated and folded over the edge face.

80. *Schumacher, 1,588,058, June 8, 1926.* A plaster board having narrow longitudinal strips of paper reinforcing the edges.

81. *Schumacher, 1,597,623, August 24, 1926.* A tongue and groove edge plaster board having a hardened composition at the edges.

82. *Peters, 1,604,236, October 26, 1926.* A plaster board having a paper facing on one side and a layer of cotton gauze embedded in the other face through which plaster protrudes in irregular formation.

83. *Melhope, 1,604,707, October 26, 1926.* A thin sealing strip is secured to one face of the plaster board to seal the abutting edges of the cover sheets.

84. *Bartlett, 1,606,051, November 9, 1926.* A mixture of excelsior, asbestos and cement with silicate as adhesive between paper sheets.

85. *Griswold, 1,608,501, November 30, 1926.* The inner faces of the cover sheets are sprayed with a solution of gum arabic and aluminum sulphate to insure adhesion.

86. *Schumacher, 1,610,817, December 14, 1926.* The edges of the plaster board are covered with a corrugated sheet the edges and dales of which extend transversely of the edge of the board.

87. *Birdsey, 1,615,815, January 25, 1927.* Rectangular plaster structural building members covered with paper to be used as ordinary wooden timbers on which plaster boards may be nailed.

88. *Utzman, 1,631,108, May 31, 1927.* The lower cover sheet is folded over the edges of the board and is provided with spaced tongues extending into the body.

89. *Weiss, 1,634,807, July 5, 1927.* The cover sheets of the plaster board are supplied with cleavage planes placed at the studding centers which are cut open for nailing purposes and then put back to conceal the nails.

90. *Weiss, 1,634,809, July 5, 1927.* Perforated nailing strips are arranged beneath and in contact with the cover sheets.

91. *Brookby, 1,638,001, August 2, 1927.* A porous plaster board having a core made from a mix of plaster of paris and ammonium caseinate. Upon drying voids are produced in the board.

92. *Utzman, 1,638,280, August 9, 1927.* A completely covered plaster board having beveled edges.

93. *Armstrong, 1,641,611, September 6, 1927.* A nail-penetrable plaster board comprising a plastic mix of deflocculated clay, a bituminous material and calcined gypsum.

94. *Speer, 1,641,648, September 6, 1927.* The edge of the board is reinforced with a tubular insert containing plaster.

95. *Clark, 1,642,840, September 20, 1927.* The margins of the cover sheet are folded over the edge faces of the board and folded again into the core.

Thermal Expansion of Feldspar

TECHNICAL NEWS Bulletins No. 117 (January, 1927), No. 121 (May, 1927) and No. 123 (July,1927) summarized the work to date in the investigation of the effect of feldspar in white-ware bodies. This report is a summary of the study of the thermal expansion, by the interferometer method, of partially and completely fused feldspars fired to cones 4, 8, 10, 12, 13 and 14. There are 19 feldspars included in the investigation ranging in composition from No. 1, which is almost pure albite, a high Na_2O content feldspar, to No. 19, which is a practically pure specimen of orthoclase, a high K_2O content feldspar. The data show:

1. The expansion of all the feldspars fired to the above temperatures proceeds quite regularly until a temperature of 575 deg. C. (1067 deg. F.) is reached, when the rate of expansion increases decidedly because of a property characteristic of quartz which at this temperature changes suddenly from the α form to β form of crystallization. This expansion of flint is not to be confused with the regular heat expansion of the feldspar, but is an additional change which is peculiar to the flint. Since this extra expansion of the flint-free spar, the true percentage of linear expansion at 560 deg. C. is reported.

2. The thermal expansion of a feldspar fired below cone 8 is low, becomes normal at cone 8 and drops again when the firing temperature rises above cone 8. Obviously this will depend upon the amount of flint in the feldspar. The low expansion of the underfired feldspar results from the fact that there is so much pore space in proportion to the solid mass that the flint is still present in the unaltered state. The low expansion of the overfired feldspar is due to the fact that the flint has been dissolved by the fused feldspar. Silica has a very high expansion as long as it remains quartz, but has a low expansion when it has been dissolved to a glass by feldspar.

3. The highest expansions noted for feldspars fired to cone 8 are for spars 6 and 7 (relatively low K_2O content feldspars), and are the result of their high silica content. The lowest expansion noted for feldspars fired to cone 8 is for spar No. 1, which is an almost pure albite (Na_2O feldspar). For cone 10 the highest expansion is seen with spars 6 and 7, due again to their high silica content, while the lowest expansion is found with spar No. 19, a high K_2O content spar.

Therefore, it seems logical to conclude that the silica content has more influence upon the expansion of partially and completely fused feldspars than the Na_2O or K_2O content, or the fineness of the grind.—*Technical News Bulletin.*

Exports of Moroccan Phospate

THE shipments of Moroccan phosphate in 1926 amounted to 1,198,077 tons, of which considerably more than half was absorbed by European markets; 1,113,714 tons went to Europe, the chief buyers being Spain 222,839 tons), France (209,970 tons), Holland (170,440 tons) and Germany (122,822 tons). The United States imported 10,703 tons of Moroccan phosphate, Australia and New Zealand imported 39,475 tons and South Africa 19,490 tons.—*American Fertilizer.*

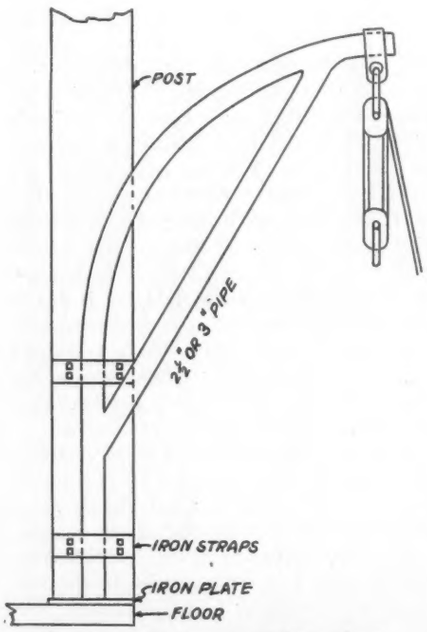
Hints and Helps for Superintendents

Handy Hoist for a Crushing Plant

By W. L. HOME
Pine Plains, New York

MOST everybody who has worked in crushing plants has had the unpleasant task of juggling heavy machinery up narrow, steep stairs to the top of some crushing plant. This is done simply because it was the regular thing to do and there was no other way provided of getting up pulleys, screen sections, gas tanks or whatever else might be needed in an emergency.

While "A" frames on projecting beams are mighty good, a hoist made as shown in



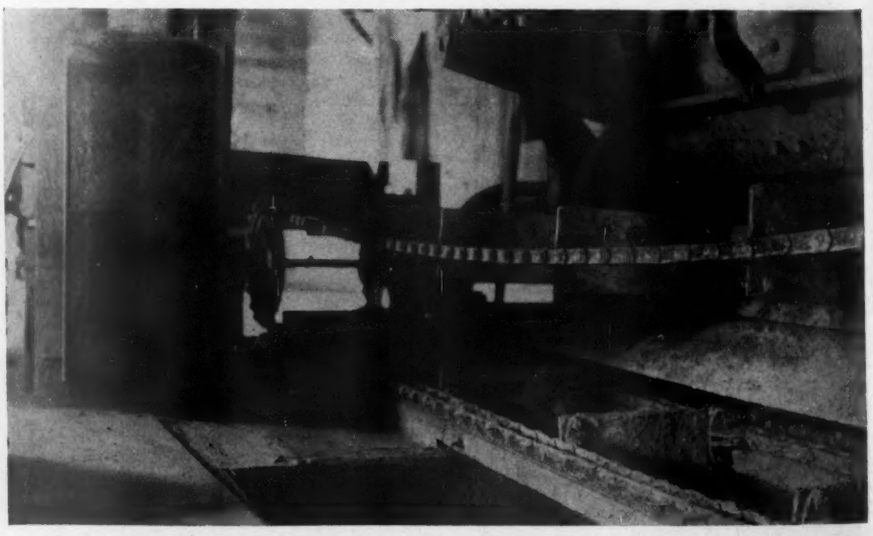
Handy hoist for a crushing plant

the sketch costs but little and is much handier.

The location is of first importance, so after determining this cut a door in the side of the wall right next to a good solid post to attach the frame to. A permanent door may be put in and made to open outward when it is desired to use the hoist, and when the hoist is not in use the hoist frame may be turned on the inside of the building and the door closed. To make the hoist frame use 2½-in. or 3-in. extra heavy pipe and bend it as shown in the sketch. Use another piece of similar pipe to make the brace as shown and weld it to the curved pipe. To get the maximum strength at the upper end of the pipe, do not drill it or flatten it out to attach the blocks, but weld a piece of shafting on the inside and attach the blocks by means of a band around the pipe. To put the frame in position attach it to a post in the wall by two bands bent loosely around the pipe so that when the bands are secured against the post the hoist frame is free to turn. Put a piece of iron plate between the floor and the bottom of the hoist frame so that the pipe will not cut into the floor, and it will turn easier. Attach your rope falls and loads up to 1500 lb. or better can be hoisted up the side of the building without rubbing or damaging the walls, and when it is hoisted the load can easily be swung inside by swinging the frame. When not in use the frame is on the inside out of the way and the door is closed. When you do want to use it everything is ready and it is a labor saver.

Home-Made Chain Drag for Wet Concrete

IN a cement products plant it is sometimes necessary to have the same mixer serve two block machines. The accompanying illustration shows how one manufacturer was able to carry the mixed concrete to a second machine cheaply and efficiently by means of a built-up chain drag constructed at the plant. In this plant the mixer is on the second floor directly above a large block machine on the floor below, which it serves through a hopper in the floor. The second machine, used for specialties, is beside the large machine on the lower floor. The hopper to the second machine is fed by a drag conveyor made up of two endless chains running on sprockets and equipped with iron flights set approximately a foot apart. These flights, or plates, were bored and bolted to the chains at the plant, and the sprockets were also from old equipment found at the plant. In using the drag an iron plate is placed across the hopper below the mixer so that the concrete falls on the plate and is carried across to the second hopper. To prevent the material from flowing around the ends of the flights a piece of board about 2 in. wide is placed under each chain for the full length of the conveyor and immediately against the ends of the plates. The drag is in use at the cement products plant of the Wm. H. Devos Co., Milwaukee, Wis.



Home-made chain drag conveys wet concrete from mixer to cement block machines

Operation of Industrial Locomotives*

By FRED M. REITER

TO CHECK the operation of a standard four-wheel, saddle-back, industrial locomotive, made by the H. K. Porter Co., some data were taken and calculations made. The object was to determine coal and water consumption, and note how often the locomotives should refuel and take water. The data were taken as a standard to check the actual operation of the locomotives. Time studies were made to determine the duration of runs, piston speed (obtained from r.p.m. of driving wheels), steam conditions, etc.

In determining water consumption, the cylinder conditions were as follows: Bore, 17¼ in.; stroke, 24 in.; piston rod, 3¼ in. This resulted in a piston area of 233.7 sq. in. at the head end and of 225.4 sq. in. at the crank end, the average being 229.6 sq. in. The total volume of the two cylinders, each revolution of a driving wheel, figures out at 12.8 cu. ft.

Steam at average boiler pressure of 150 lb. gage represented 360 deg. F. The aver-

*Reprinted from *Iron Age* (1928), 380.

age cylinder pressure was throttled to 60 lb. gage, with 5% moisture. The locomotive was operated with the reverse lever open wide, regulation of speed being made by the operating throttle. Thus no cut-off occurs in the cylinder, although the pressure is considerably reduced.

Density of steam at 60 lb. gage is 0.1721 lb. per cu. ft. The moisture in it weighs 0.0130 lb., making the total weight 0.1851 lb. The average operating speed of the engine was 23 r.p.m., determined by count at the driving wheel. The weight of steam consumed each hour at 23 r.p.m. was 3268 lb. This represents a consumption of 394 gal. of water an hour, to which must be added 12 gal. for the air-brake engine.

Losses included 1% for popping, 2% for blow-off and 7% of steam to the flues for producing draft and for leaks, etc. This makes a total of 10%. Injector steam is not figured, as this is returned to the boiler with the water. Thus the apparent water consumption of 406 gal. an hour figures up to 450 gal.

The tank capacity (saddle back) is 1650 gal. Of this amount 210 gal. in the legs of the tank cannot be taken out by the injectors. This leaves 1440 gal. net delivered by the tank. With low water in the boiler, when the locomotive is filled, an additional 610 gal. would be required, making a total of 2050 gal. put in each time the tank is filled.

Dividing this amount by 450 gal. an hour gives 4.54 hours duration of the water supply under steady continuous operation. As the locomotive is idle between runs, about 40% of all time, including the periods when steam is off and the locomotive is coasting, etc., the overall duration of water per fill is about 7.6 hours.

Heat input into water at 200 deg. F. to produce steam at 150 lb. gage pressure is 1017 B.t.u. per pound. The total heat per hour to make steam thus figures out at 3,847,311 B.t.u. an hour. About 2% of the water is used for blow-off, having been heated from 200 to 360 deg. This adds 12,160 B.t.u., making the total heat absorption of the boiler 3,859,471 B.t.u. an hour. With a boiler efficiency of 50%, the heat supplied must be 7,720,000 B.t.u. an hour.

Consumption of coal of 13,500 B.t.u. per pound calorific value would thus be 572 lb. an hour. Figuring on 40% idle periods, this reduces to 343 lb. The bunker capacity with the fire low before loading and maximum coal taken on was found to be 1700 lb. Thus the duration of one fill or coal supply works out at just under 5 hours.

Actual operation of the locomotives, when operated with reasonable care, checked these figures closely.

Blasting Cap Used as Signal

WHEN setting off a number of small shots in quarries at the same time, using fuses, as when mudcaping quite a few rocks at once, it is often desirable to have several men lighting the fuses. When this is done it is advisable to have some system of warning them when to stop lighting and seek cover. One of the plans for this is a signal fuse. For example, if 4 ft. of fuse is used for each charge, a signal fuse 2½ or 3 ft. long is attached to a blasting cap, lighted first and thrown among the rocks at a safe distance. Then men can continue lighting until the signal cap fires and will then have from 30 to 60 seconds to reach a place of safety.—*Explosive Service Bulletin.*

Simple Device for Determining Specific Gravity and Moisture in Aggregates

IN the past year or two several devices for determining moisture content, specific gravity and absorption of concrete aggregates have been introduced. Most of these require a special (and usually rather delicate) piece of apparatus such as the Chapman flask. The Iowa State Highway Department has recently introduced a method that uses an ordinary fruit jar with a special metal top that is cheap, not easily broken, and adapted to use with coarse as well as fine aggregate.

Device used to determine specific gravity and moisture in aggregate

The device is really what physicists call a "pycnometer" or specific gravity flask. The jar chosen is of any shape that will not entrap air and the metal conical top may be made by a tinsmith, as the one shown in the photograph was. The Iowa department now uses a top of spun copper, bought in quantity. A rubber gasket goes between the top of the jar and the metal cone to make a water tight joint. A balance weighing to 5000 g. and sensitive to 1 g. is also needed.

The device may be used for determining specific gravity in the way that is given in many textbooks and handbooks of testing. For determining moisture content the theory, according to the inventors of the device, is as follows:

Let P = Weight of pycnometer filled with water.

Let G_s = Specific gravity of material when in a saturated surface dry condition.

Let s = Weight of sample in grams.

Then $\frac{s}{G_s}$ = The volume of the sample if in a saturated surface dry condition.

Let $W = P + s - \frac{s}{G_s}$ which is the weight of the pycnometer plus the weight of the sample plus the weight of enough water to fill the pycnometer with the sample in the pycnometer, if the sample were saturated and surface dry.

Let x = the number of grams of free water in the sample or the number of grams of water that will be absorbed by the sample (x will be positive if the sample contains free water and negative if the sample absorbs water).

Then $\frac{s-x}{G_s} + x$ = the volume which will be displaced by a sample containing $\pm x$ grams of free moisture.

Let $W_1 = P + S - \left(\frac{s-x}{G_s} + x\right)$ which is the weight of the pycnometer plus the weight of a sample containing $\pm x$ grams enough water to fill the pycnometer with this sample in the jar.

$$W - W_1 = P + s - \frac{s}{G_s} - P - s + \left(\frac{s-x}{G_s} + x\right)$$

$$W - W_1 = \frac{s}{G_s} + \frac{s-x}{G_s} + x$$

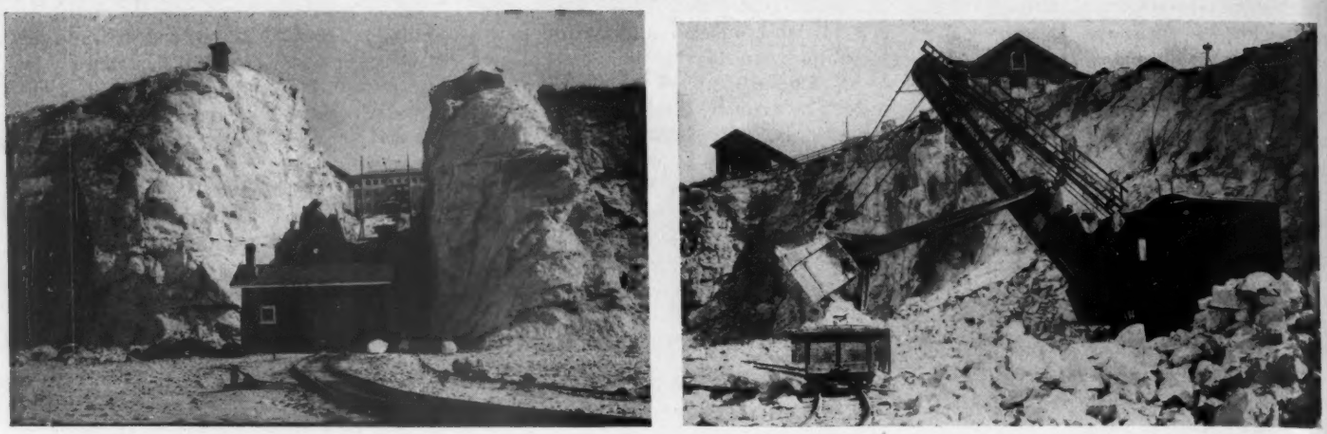
$$W - W_1 = \frac{-s + (s-x) + xG_s}{G_s}$$

$$W - W_1 = \frac{x(G_s - 1)}{G_s}$$

$$x = (W - W_1)\frac{G_s}{G_s - 1}$$

Absorbtion may be determined in the same way, the answer being a minus quantity if any of the water is absorbed.

This device was developed by Bert Myers and Clyde Mason, both in the testing engineers' department. It has recently been adopted as a standard method by the Association of State Highway Engineers.



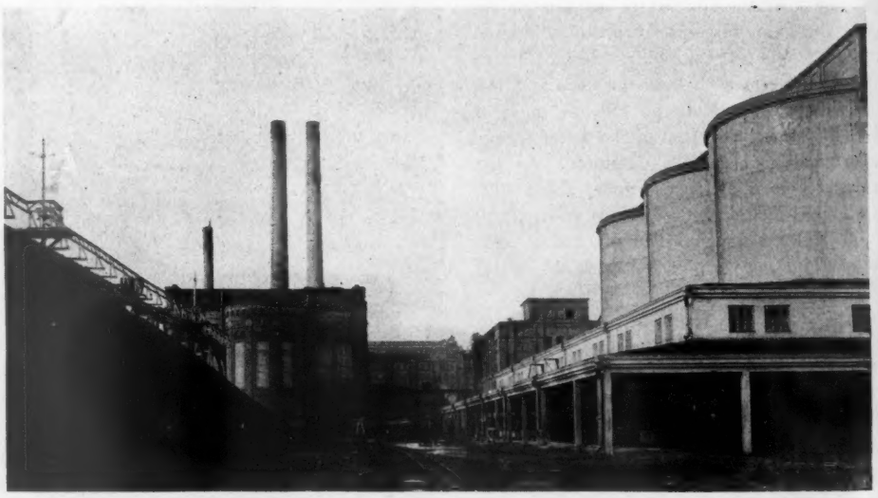
Part of the limestone quarry of the Pargas Kalkbergs Aktiebolag, Pargas, Finland

Finland's Largest Quarry Operation

Pargas Kalkbergs Aktiebolag Faces a Problem in Expanding Its Quarry Output

THE largest producer of cement and lime and incidentally the largest quarry operator in Finland is the Pargas Kalkbergs Aktiebolag, Pargas. Operations are carried on on a large scale (judging by European standards), over 1500 tons per day being quarried, practically all of which is consumed in the manufacture of cement and lime. The stone is a crystalline high calcium limestone in which massive veins of granite occur, the granite comprising about 25% of the deposit.

The accompanying views show parts of the quarry and a number of different buildings. There is a general air of orderliness about the structures and grounds which is typical of many European rock products operations. The newer American cement mills are carrying out this idea, so that beauty and utility in plant design is no longer confined to Europe, as in the past.



Kiln house (left) and cement storage silos (right)

Crusher house and auxiliary buildings

Quarrying is carried out in a manner identical with American practice; the blasted rock is loaded by power shovel to quarry cars and drawn up an incline to the crusher house. Part of this incline is double tracked, thus permitting two cars to be drawn up at one time. This arrangement has worked out successfully for a number of years, but of late increased demand for cement has brought about a problem to expand the quarry operation and transportation system to furnish the extra rock needed.

The general manager of the company, H. Lowry, has written ROCK PRODUCTS for advice in this matter and we are publishing his letter in the hopes that several of our readers who have experienced similar difficulties will be able to furnish him with advice. The letter follows in part:

"On account of an increasing demand for

cement our firm now has to consider plant enlargement, and providing it with material is much complicated because the present manner of raising it will not suffice, and also because another quarry, about 300 meters (1000 ft.) distant from the crusher, is to be worked at the same time. This new quarry is at present about 20 meters (66 ft.) deep, and its output is intended initially to be 1000 tons per 10 hours, but will be doubled later on. The big crusher is about 10 meters (33 ft.) above the ground.

"We have taken a great interest in reading your excellently edited periodical and have lately noticed your articles on the granite quarries and plants of the Palmetto Quarries Co., Columbia, and of Weston & Brooker at Cayce, near Columbia, S. C. We should like to take advantage of the experiences these firms have gained with cable hoists for long distances and big loads.

"The question of importance is whether for a distance of 300 meters a cableway hoist is preferable to a horizontal hoist with cars on the edge of the quarry. The cars would there be hoisted to the level of the crusher and pushed to the crusher on trestle tracks.

"If you could give us some advice concerning this matter, we should be very much obliged. At the same time we should like to have the names of the firms which have constructed the machines for the plants."

ROCK PRODUCTS will be pleased to receive communications in regard to this for forwarding to the Pargas company, as well as to publish for the interest of other quarry operators.

Looking down into the quarry

Incline from quarry to crusher house

Car dumping to primary crusher

Competition—Two Kinds

A GROWING CONVICTION among business men that competition is not an economic cure-all but has its vices as well as its virtues is indicated in an address by F. Stuart Fitzpatrick, of the organization service of the Chamber of Commerce of the United States.

"Competition," he said, "is often ruthless in its operation. It frequently works not creatively to serve the consumer more acceptably but destructively to ruin rivals or runs to sharp practice at the expense of the consumer. An expression of individualism in industry, competition develops excesses which threaten to destroy individualism. It is today generally recognized that unfair competition is an evil as injurious to the public as it is to business. It is neither economically nor morally desirable to require a man to have the conscience of a horse trader in order to survive in the free play of a competitive economy.

"Cut throat competition may so consume men's energies in fighting that they have no time to devote to improving methods and processes; it may so reduce an industry's margins that it cannot afford to improve processes and methods. This is another economic waste. These and other wastes all enter into the competitive prices the consumer pays."

Portland Cement Output in January

Production and Shipments Show Marked Increase Over January, 1927—Stocks at a High Point

THE portland cement industry in January, 1928, produced 9,782,000 bbl., shipped 6,531,000 bbl. from the mills, and had in stock at the end of the month 25,193,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in January, 1928, showed an increase of nearly 12%, and shipments an increase of about 11%, as compared with January, 1927. Portland cement stocks at the mills were 11% higher than a year ago.

The statistics here presented are compiled from reports for January from all manufacturing plants except four, for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity, the total output of finished cement is compared with the estimated capacity of 155 plants at the close of January, 1928, and of 141 plants at the close of January, 1927.

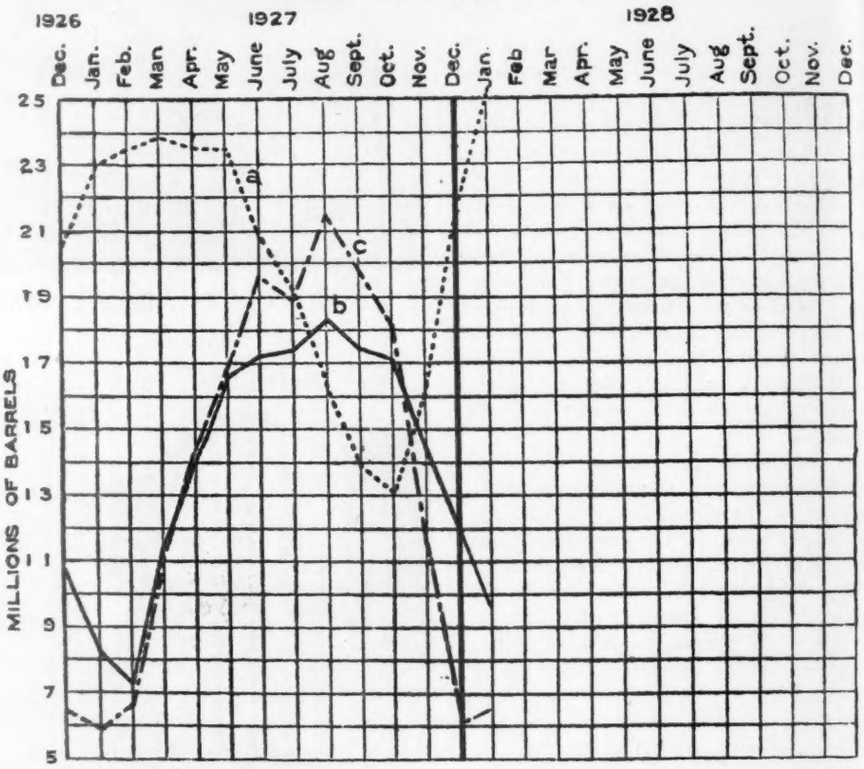
RELATION OF PRODUCTION TO CAPACITY

	Jan. 1928 Pct.	Jan. 1927 Pct.	Dec. 1927 Pct.	Nov. 1927 Pct.	Oct. 1927 Pct.
The month	49.5	45.1	60.7	75.9	87.4
12 mo. ended—	74.5	76.4	76.2	73.7	73.6

Clinker Stocks

Stocks of clinker, or unground cement, at the mills at the end of December, 1927, amounted to about 7,349,000 bbl. compared with 7,599,000 bbl. (revised) at the beginning of the month. An estimate of unground clinker at the mills at the end of each month is given on the succeeding page.

MONTHLY FLUCTUATION IN PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT



(a) Stocks of finished portland cement at factories; (b) Production of finished portland cement; (c) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among states to which cement was shipped during November and December, 1926 and 1927:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES, IN NOVEMBER AND DECEMBER, 1926 AND 1927, IN BARRELS*

Shipped to—	1926—Nov.—	1927	1926—Dec.—	1927
Alabama	134,009	252,077	117,426	155,046
Alaska	173	132	297	132
Arizona	27,412	52,276	39,536	59,434
Arkansas	79,627	85,638	42,245	57,179
California	887,351	1,027,706	901,526	826,042
Colorado	61,057	74,276	31,711	26,653
Connecticut	147,288	170,103	52,141	86,678
Delaware	17,682	20,630	6,528	11,949
District of Columbia	78,369	70,727	64,457	35,784
Florida	418,696	142,655	317,402	113,512
Georgia	161,710	143,624	110,139	82,539
Hawaii	21,417	8,726	25,732	15,410
Idaho	25,409	16,447	13,199	4,450
Illinois	776,758	880,391	446,515	355,233
Indiana	289,720	289,212	108,771	95,953
Iowa	116,116	123,547	37,153	23,998
Kansas	169,035	218,395	88,010	54,317
Kentucky	120,647	114,964	62,172	54,834
Louisiana	74,619	110,968	89,843	87,947
Maine	19,168	30,019	6,255	10,829
Maryland	212,972	180,358	135,181	79,514
Massachusetts	234,087	237,558	72,231	116,135
Michigan	702,901	641,339	292,167	288,891
Minnesota	87,777	96,509	40,916	31,387
Mississippi	61,685	97,083	60,858	54,701
Missouri	315,318	305,254	152,647	122,565
Montana	16,169	14,205	6,455	7,373
Nebraska	64,198	58,307	26,933	22,308
Nevada	4,751	6,789	3,150	7,165
New Hampshire	32,190	34,719	18,340	17,710
New Jersey	688,736	672,737	255,744	335,550
New Mexico	18,965	23,695	13,639	8,574
New York	1,584,352	1,514,114	788,046	974,050
North Carolina	276,568	264,393	183,912	112,931
North Dakota	8,969	5,437	2,439	1,506
Ohio	651,257	675,806	312,336	265,784
Oklahoma	225,767	319,776	120,560	166,633
Oregon	75,541	80,653	47,637	51,119
Pennsylvania	1,013,955	932,367	469,376	483,869
Porto Rico	7,250	0	13,250	0
Rhode Island	47,278	58,352	19,813	23,079
South Carolina	46,692	133,046	31,523	76,157
South Dakota	10,076	13,870	3,625	1,573
Tennessee	124,551	174,923	82,556	96,493
Texas	419,358	506,726	303,770	320,825
Utah	34,358	30,046	12,944	13,669
Vermont	14,455	21,938	3,844	12,700
Virginia	127,290	145,820	61,351	76,872
Washington	131,602	129,611	90,856	95,166
West Virginia	104,150	104,307	63,680	42,219
Wisconsin	169,068	214,907	95,776	89,820
Wyoming	8,160	15,407	7,430	7,691
Unspecified	54,253	32,465	396	14,566
	11,200,962	11,575,030	6,354,439	6,176,514
Foreign countries	75,038	43,970	77,561	49,486
Total shipped from cement plants	11,276,000	11,619,000	6,432,000	6,226,000

*Includes estimated distribution of shipments from three plants in November and December, 1927, and from five plants in November and December, 1926.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JANUARY, 1927 AND 1928, AND STOCKS IN DECEMBER, 1927, IN BARRELS

District	Production 1927—Jan.—1928		Shipments 1927—Jan.—1928		Stocks at end of January 1927	1928	Stocks at end of Dec. 1927*
Eastern Penn., N. J. & Md.	2,510,000	2,351,000	1,422,000	1,545,000	5,116,000	5,886,000	5,080,000
New York	318,000	549,000	165,000	316,000	1,438,000	1,761,000	1,529,000
Ohio, West'n Penn. & W. Va.	563,000	755,000	420,000	458,000	2,620,000	2,926,000	2,630,000
Michigan	448,000	374,000	261,000	295,000	2,093,000	2,220,000	2,141,000
Wis., Ill., Ind. & Ky.	923,000	1,408,000	464,000	501,000	3,441,000	3,480,000	2,573,000
Va., Tenn., Ala., Ga., Fla. & La.	899,000	1,109,000	921,000	938,000	1,167,000	1,851,000	1,680,000
East'n Mo., Ia., Minn. & S. D.	509,000	1,096,000	247,000	284,000	3,199,000	3,544,000	2,731,000
West'n Mo., Neb., Kan., Okla.	468,000	451,000	398,000	451,000	1,847,000	1,622,000	1,623,000
Texas	383,000	463,000	365,000	447,000	461,000	423,000	407,000
Colo., Mont. & Utah	121,000	175,000	77,000	67,000	518,000	473,000	364,000
California	974,000	939,000	1,088,000	1,111,000	551,000	616,000	788,000
Oregon and Washington	142,000	112,000	140,000	118,000	463,000	391,000	396,000
	8,258,000	9,782,000	5,968,000	6,531,000	22,914,000	25,193,000	21,942,000

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1927 AND 1928, IN BARRELS

	1927—Production—1928		1927—Shipments—1928		Stocks at end of month 1927	1928
January	8,258,000	9,782,000	5,968,000	6,531,000	22,914,000	25,193,000
February	7,377,000	.....	6,731,000	.....	*23,563,000	.....
March	*11,450,000	.....	*11,100,000	.....	23,922,000	.....
April	14,048,000	.....	14,350,000	.....	23,654,000	.....
May	16,701,000	.....	16,865,000	.....	23,503,000	.....
June	17,224,000	.....	19,761,000	.....	20,972,000	.....
July	17,408,000	.....	18,984,000	.....	19,397,000	.....
August	18,315,000	.....	21,411,000	.....	16,292,000	.....
September	17,505,000	.....	19,828,000	.....	13,996,000	.....
October	17,174,000	.....	18,105,000	.....	13,141,000	.....
November	14,449,000	.....	11,619,000	.....	*16,022,000	.....
December	11,999,000	.....	6,200,000	.....	21,821,000	.....
	171,908,000	.....	170,922,000	.....	.....	.....

*Revised.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1926 AND 1927

	Exports				Imports			
	1926		1927		1926		1927	
Month	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	72,939	$216,431	75,346	$254,072	360,580	$576,717	193,175	$269,661
February	73,975	220,706	71,404	233,985	314,118	527,948	130,421	200,680
March	69,080	205,647	67,956	240,165	493,241	812,968	181,145	261,519
April	96,296	284,772	72,383	243,832	257,302	398,114	191,868	313,262
May	78,601	224,365	59,332	205,574	223,130	337,031	178,929	263,618
June	80,684	248,814	69,205	237,281	335,570	495,744	129,111	201,682
July	130,822	370,220	72,337	229,737	250,862	395,981	175,035	249,665
August	64,946	216,489	61,371	209,198	350,638	560,532	117,605	170,167
September	70,920	239,174	57,888	207,817	194,129	308,224	233,066	297,716
October	69,389	225,874	67,639	230,668	263,403	386,335	221,274	321,777
November	76,598	238,103	79,869	257,476	55,233	82,949	141,485	190,419
December	89,976	305,238	62,099	226,960	151,850	246,293	156,609	209,205
	974,226	$2,995,833	816,829	$2,776,765	3,250,056	$5,128,836	2,049,723	$2,949,371

Exports and Imports

(Compiled from the records of the Bureau of Foreign and Domestic Commerce. Figures for 1927 subject to revision)

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN DECEMBER, 1927

Exported to—	Barrels	Value
Canada	1,025	$ 3,913
Central America	14,172	45,042
Cuba	4,301	14,537
Other West Indies and Bermuda	2,769	6,460
Mexico	5,845	18,864
South America	27,779	101,530
Other countries	6,208	36,614
	62,099	$226,960

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES, AND BY DISTRICTS, IN DECEMBER, 1927

Imported from	District into which imported	Barrels	Value
Belgium	Florida	17,397	$24,949
	Galveston	3,000	3,777
	Massachusetts	41,745	53,245
	New Orleans	200	252
	New York	6,001	7,445
	Oregon	2,000	2,437
	Philadelphia	16,588	23,818
	Porto Rico	5,000	6,127
	Rhode Island	15,637	20,602
	South Carolina	14,050	17,418
	Virginia	2,913	5,922
	Washington	4,000	5,534
	Total	128,531	$171,526
Canada	Me. & N. H.	931	$2,328
	Vermont	1,332	1,981
	Total	2,263	$4,309
Denmark	Porto Rico	24,313	$30,489
Germany	Los Angeles	1,000	$2,173
United K'd'm	New Orleans	500	$704
	New York	2	4
	Total	502	$708
	Grand total	156,609	$209,205

ESTIMATED CLINKER (UNGROUND CEMENT) AT THE MILLS AT END OF EACH MONTH, 1927 AND 1928, IN BARRELS

Month	1927	1928
January	9,989,000	9,349,000
February	11,943,000	.....
March	12,997,000	.....
April	13,335,000	.....
May	12,514,000	.....
June	10,926,000	.....
July	9,609,000	.....
August	7,887,000	.....
September	6,490,000	.....
October	5,960,000	.....
November	6,374,000	.....
December	*7,599,000	.....

*Revised.

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN DECEMBER, 1927

	Barrels	Value
Alaska	311	$ 976
Hawaii	14,261	34,806
Porto Rico	6,275	14,392
	20,847	$50,174

Again the Political Cement Plant Comes Up

AT a meeting of his council recently, Governor Young of California requested that A. R. Heron, state director of finance, and B. B. Meek, director of public works, devise means of overcoming the alleged high prices charged for cement used in the construction of highways and other state work. The governor said it might be well to investigate legislation proposed at the last session of the legislature by State Senator J. M. Inman that would have provided for the establishment of a state cement plant.

Mr. Heron declared that it might be a good idea for the state to supply all the cement for highway jobs, but Mr. Meek said this idea had been under consideration for two months and that on preliminary findings the engineers of the state highway division believed the saving to the state would not warrant the experiment.

"This discussion brings to mind the Inman bill," remarked Governor Young, "for the establishment of a state owned and operated cement plant. We might easily spend $1,000,000 on such a project and get back every penny expended without even turning a wheel in the plant. We don't want to deny legitimate profits, but profiteering at the expense of the public must be stopped." —*San Francisco* (Calif.) *Chronicle.*

Paving Uses Large Share of 1927 Cement Production

MORE than 45,000,000 bbl. of cement were required to make the concrete roads, streets and alleys built in the United States during 1927, according to cement industry statistics. This was 27% of the total production of portland cement in this country.

It requires approximately 3234 bbl. of cement, 967 cu. yd. of sand and 1431 cu. yd. of stone to make one mile of concrete road of standard design 18 ft. wide and 7 in. thick. Last year approximately 6000 miles of concrete rural roads were constructed, in addition to 3000 miles of streets of average 30 ft. width and 475 miles of alleys of average 18 ft. width.

Cement Industry in the State of Washington

THE cement industry in the state of Washington, which is now equipped to turn out 3,907,000 bbl. of cement yearly, has more than doubled its capacity since 1926.

Last year's production in Washington totaled 2,247,477 bbl., of which 2,091,082 bbl. were sold, adding $4,736,813 to the industrial revenue of the state. The capital investment totaled $411,721.

Employment records for 1926 show that the cement industry employed 562 wage earners and 112 officers and other salaried employes. In wages and salaries the industry paid $1,112,412, including only direct employment.

The industry is concentrated in the four counties of Pend Oreille, Skagit, Spokane and Whatcom. As a major contribution to other industries and institutions of the state, during 1926 cement manufacturers purchased 196,654 tons of coal at a cost of $491,635; 12,361 tons of gypsum at $40,173; 732,052 cotton sacks at $117,128; new machinery and mill supplies at $843,300; electric current totaling $359,596, and added to railroad revenues to the extent of $1,706,379.—*Seattle* (Wash.) *Business Chronicle.*

Sand Settling and Devices for Settling and Classifying Sand

Part II.—Elementary Forms of Settlers and Classifiers

By Edmund Shaw
Editor, Rock Products

IN the first part of this series it was stated that all settlers and classifiers used either surface currents, rising currents or a combination of them. This part will describe some of the ways in which these currents are applied. The descriptions here are of simple, elementary forms which illustrate the principle used. The forms in actual use (commercial devices) will be describer later.

The words settler and classifier may be used interchangeably to describe some of the arrangements, but this is because the particular form is used for settling more than classifying or vice versa, as the case may be. It has already been explained that when settling is used by itself the word means that all the solids in suspension are settled out of a flowing stream (except the clayey material, perhaps). When classification is used it means that part of the solids are settled out and the remainder are overflowed, thus making a separation. Any form of settler may be used as a classifier and any form of classifier may be used as a settler.

Surface Current Devices

The simplest form is the surface current box which is used for both settling and classifying. It is shown in Fig. 1. It is merely a box with the flow coming in at one end and going out at the other. Below the current is a space filled with still water in which any grains so heavy that they cannot be carried by the current across the box settle out.

This box form is used as shown in commercial plants. But as it is not easy to remove the settled sand from such a box (for reasons that will be explained later) the form is changed by making it into a hopper. Settled sand will flow like a liquid *under water* (unless it contains fines and clay) and hence it will settle to the bottom of the hopper and run out of an opening there. Fig. 2

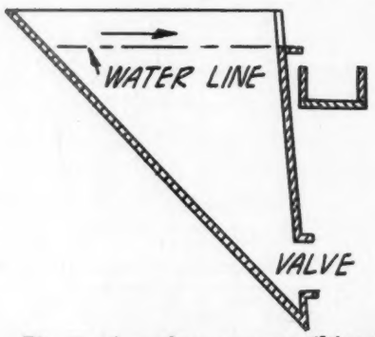


Fig. 3. A surface current tilting box

shows such a form, which is the ordinary "tipple" used for collecting sand and loading cars at many sand plants.

Tilting boxes are like the hoppered "tipple" shown except that they are smaller and are provided with an automatic discharge valve that operates only when the sand has reached a certain level. Not all of these work on the surface current principle; a great many of them work on the rising current principle. One form using a surface current is shown in Fig. 3.

Buddles

A peculiar form of surface current classifier is called a buddle. Such devices are not used much anywhere today, but they formerly were used a great deal in the mining industry. The writer has seen them successfully used as sand collectors, as on the Arkansas river, and their advantage was that they delivered the sand free from leaves and trash. As they require considerable attention and labor, they are not much in favor. The same result, the cleaning of the sand from trash, can be obtained by other devices that are more nearly automatic in their operation.

The buddle, shown in Fig. 4, is a long box or square tank which is usually made of concrete through which the current carrying the sand flows. The overflow is lower than the entrance and the sand as it settles forms a hill over which the water flows. The grains too heavy to be carried by this flow stay on the hill and the fines go with the water to the overflow. Some of them stop in the little pool at the foot of the hill. Leaves and pieces of trash present so much more surface to the water, in proportion to their weight, that they are worked down the hill (if they should happen to catch on it) and go out with the overflow or stop in the little pool. When the sand is taken out (usually by a clamshell bucket) the trash and fine sand that has collected in the pool may be left behind and sluiced to waste or otherwise disposed of.

While the large form of buddle, illustrated here, is not much used, the buddling principle, washing off sand by flowing water over it, is employed in several mechanical devices which dig out settled sand and drag it up an incline.

Launder Classifiers

A form that seems a little difficult to place at first, as it does not have a current flowing over a body of still water, is the launder classifier, in which the flow is carried in a launder (or flume) or pipe far enough for the heavier grains to settle to the bottom. It is more like surface current than rising current devices, because it uses the transporting power of the current.

This form of classifier is shown in Fig. 5. The flume or launder shown here is V section, but square section launders are also used. The principle is so simple that it hardly needs explanation.

A launder of this kind has been much used over sand "tipples" in the sand plants of the Trans-Mississippi states, taking the discharge of a dredge pump and separating the sand,

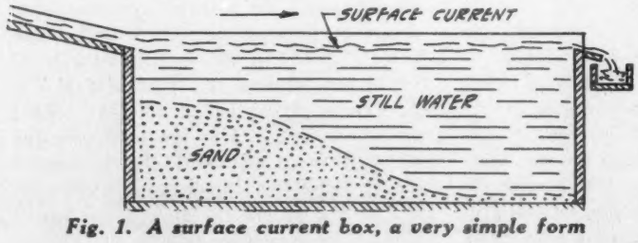


Fig. 1. A surface current box, a very simple form

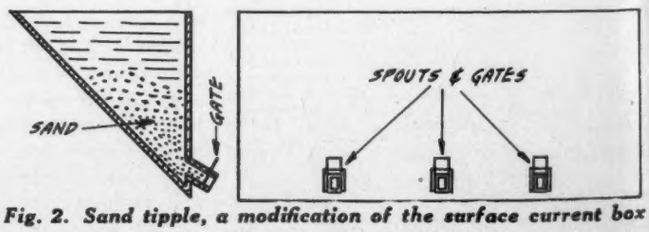


Fig. 2. Sand tipple, a modification of the surface current box

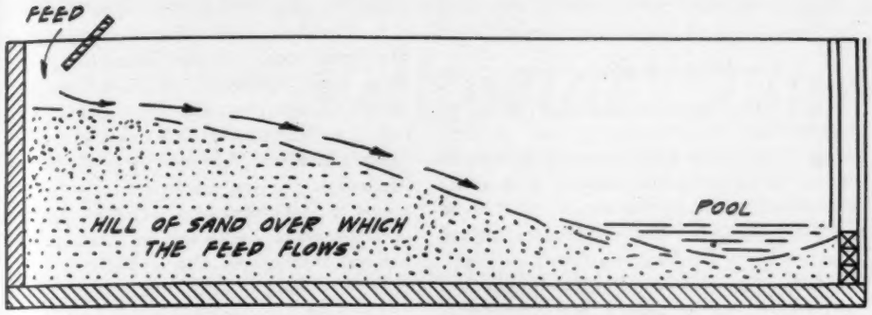


Fig. 4. Box which employs the "buddling" principle

with part of the water, for settling in the tipple below. Usually there are two or three outlets in the launder so that the sand will not all be settled in one part of the tipple. This gives coarser sand under the first outlet, but by loading from two or three spouts at the same time a somewhat uniform product can be loaded into a railway car. The device does not seem to be used as much as it formerly was.

Rising Current Devices

In the surface current devices described gravity and the flow of water operate at right angles, causing the grain to take an angular path in its downward course. In rising current devices gravity and the flow of water are opposing forces, causing the grain to sink or rise, according to whether the force of gravity or the upward force of the current is stronger. There are two forms, one which uses only the water in the pulp stream to make the rising current, the other which uses water from another source than the pulp stream to make the rising current. The water from another source than the pulp stream is called *hydraulic water*, and devices which use it are called hydraulic classifiers.

The simplest form of rising current device is probably the old-fashioned spitzlutte, so far out of date today that modern books hardly mention it. The construction is shown in Fig. 6. It is a V channel with an outlet at the apex of the V. The current flows down one side of the V and up the other and particles that are too heavy to be lifted by the rising current go out at the opening in the apex.

This can be run as a hydraulic water device and Fig. 6 shows it arranged that way.

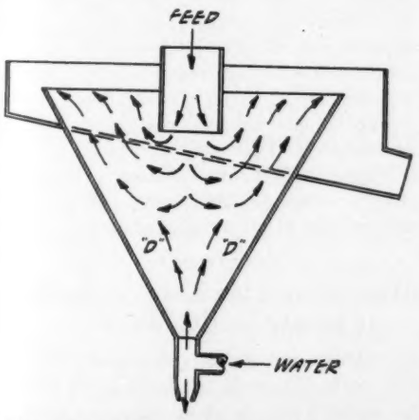


Fig. 7a. Plain hydraulic cone, a poor form of classifier. "D"-"D," dead spaces

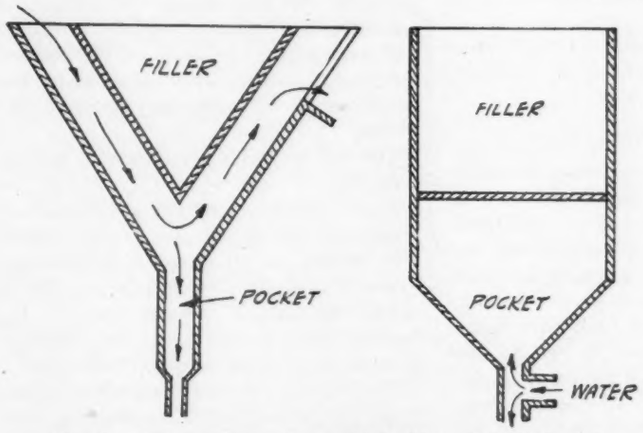


Fig. 6. Two sections of an old fashioned "spitzlutte"

The hydraulic water is put in at one side and flows up into the V and down to the outlet. If enough hydraulic water is put into the V so that the rising current in the pocket below is as strong as the rising current in the arm of the V, the falling grains will meet everywhere the same rising current and only the heavier grains will go out with the sand discharge.

The spitzlutte has been superseded by one of the forms of tubular classifier, where such a device is used at all. One form of tubular classifier, with hydraulic water, is shown in Fig. 7. Its action will be readily understood if the description of the spitzlutte has been understood.

The Plain Cone

A form of rising current classifier, using hydraulic water, that has been much employed in earlier work, is a plain cone with attachments for putting hydraulic water into the discharge. It works fairly well for displacing clayey water with clean water, but for classifying sands (removing fine sand with the overflow) the writer's experience has been that it is about the poorest device that can be used for such work. A glance at the section, shown in Fig. 7*a*, will show why this is so. A grain which is light enough to be pushed out of the discharge by the rising current of the hydraulic water may still be too heavy to be carried out in

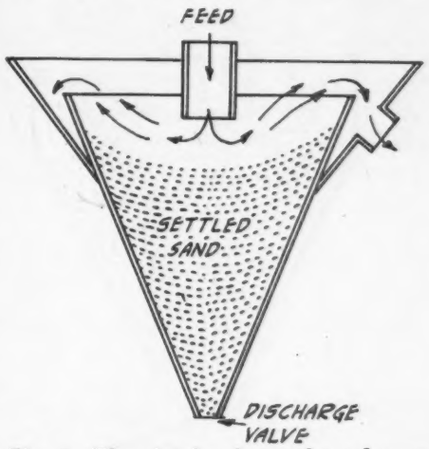


Fig. 8. The circular form of sand cone with rising current

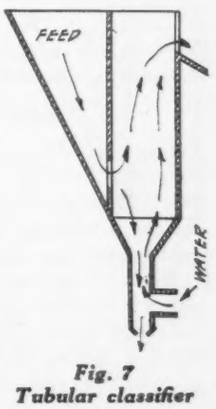


Fig. 7 Tubular classifier

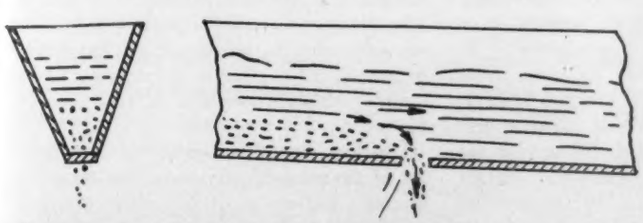


Fig. 5a. A hole in a launder used as a rough form of classifier

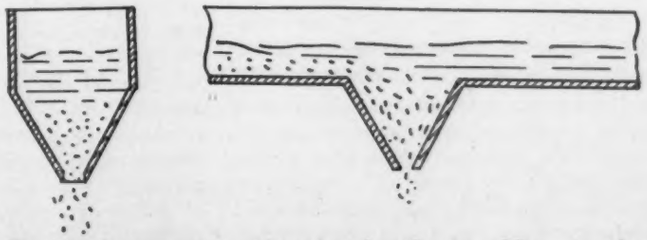


Fig. 5b. Improvement of launder classifier by adding a pocket

the overflow by the rising current set up by the feed water. Hence it will stay in the cone, and when enough such grains have accumulated they will form a bank on the side and later fall down and choke the discharge. This banking is induced by the fact that there are dead spaces in the cone as the diagram shows. Some commercial forms of

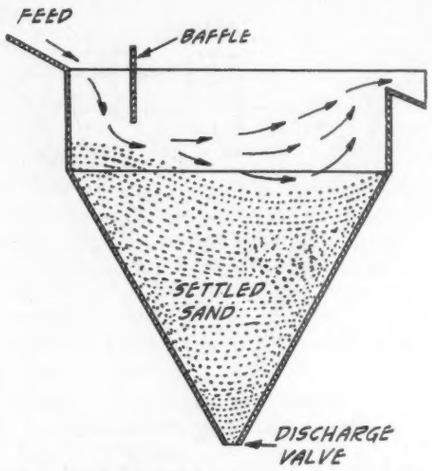


Fig. 9. Pyramidal form that may have rising or surface current

the plain cone have devices for obviating the dead spaces and are good classifiers. They will be described later.

Sand Cones

There are certain rising current devices in which hydraulic water cannot very well be used. They are employed as dewaterers (simple settlers) and as classifiers and they may be called sand cones or quicksand cones, because the discharge from them is a quicksand, all the voids being filled with water. One simple form is shown in Fig. 8. The section is circular, but the form may be that of an inverted pyramid with the feed moving across instead of from the center outwardly as in the cone. One is shown in Fig. 9, and it will be seen that if the baffle shown is lifted the flow will be a surface current and not a rising current.

Cones (or pyramids) of this type are usually fitted with some sort of an automatic sand discharge which remains open so long as there is a bed of settled sand in the cone. Most of these work by the weight of the sand. The best known of such forms will be shown in later numbers of this series.

A hole in the ground, or a tank or basin set in the ground, is used as a sand trap in some pumping plants. It is really a rising current classifier like the sand cone.

The thickener, "hydro-cone," "hydro-rotator" and various other machines are devices using a rising current in a very large tank.

The various mechanical classifiers using rakes, screws and drags to draw out the settled sand from the bottom of a settling basin use a rising current or something approaching it to effect a separation of fine and coarse particles. The way in which the current is used in each of these machines will be given in descriptions to be published later.

Combinations of Currents

Classifiers employing a combination of currents are fairly common, most of them being a combination of a current in a launder and a pocket below supplied with a rising current of hydraulic water. But rising currents can be put into any surface current classifier, even the long box shown in Fig. 1. In fact, it is very good practice to put a perforated pipe in such a box just below the overflow. This supplies a rising current that prevents an eddy and a backflow that would carry fine particles (intended to go into the overflow) back into the still water where they would settle.

(To be continued.)

Fertilizer Industry Plans to Supply British Empire

A PLAN to supply the entire British Empire with fertilizers manufactured by the Imperial Chemical Industries, Ltd., is outlined in a statement issued recently by the Department of Commerce, based on information collected by the Chemicals Division of the Department. In addition to furnishing a supply of nitrogenous fertilizers sufficient to meet the needs of the Empire, the plan as outlined calls for extensive experimentation with other new synthetic fertilizers.

The full text of the statement is as follows:

A vast scheme of agricultural research and experiment throughout the British Empire was outlined to delegates of the Imperial Research Conference recently by Sir Alfred Mond, chairman of Imperial Chemical Industries, Ltd., according to the Chemical Division of the Department of Commerce.

The Imperial Chemical Industries plans to supply the whole British Empire with fertilizers, as outlined. Its nitrogen fixation plant at Billingham will be expanded immediately to provide for increased British and world requirements.

Nitram, Ltd., which succeeds the British Sulphate and Ammonia Federation, will expand its activities. It is planned to have, in addition to an efficient sales organization, an equally large organization to make known the uses and values of the new synthetic fertilizers.

A research station has also been established with upwards of 400 acres of farm lands, where problems relating to use of fertilizers and to the feeding of stock are to be investigated. One of the most important subjects which will be undertaken at the research station is the experimental inquiry as to the synthetic fertilizers most suitable to the British and overseas requirements, for it is evident that the synthetic manufacturing activities of Billingham are not likely to be confined to the manufacture of simple nitrogenous fertilizers, such as sulphate of ammonia, but will extend to the production of dual and triple fertilizers.

For example, in South Africa experiments are being made in the Transvaal, Natal, Cape, and Rhodesia; in East Africa in Kenya, Tanganyika, and Nyasaland; in West Africa in Nigeria, the Gold Coast, and Sierra Leone; in North Africa, etc., in Sudan and Mauritius. In the Caribbean area experiments are in progress in Trinidad, Jamaica, and Demerara; in Indian, in Bombay, Ceylon and Burma, and also in Palestine in the Near East, and in Australia.

The field of research has not been limited to the Empire, for other experiments are being conducted in the United States, Egypt, China, Japan, Netherland East Indies, Belgium and Spain. The world-wide tests are being made on an extensive list of crops.

Many of the trials were designed specially to test the suitability of nitro-chalk for use in tropical and subtropical countries. It is said evidently that nitro-chalk has been found to be suitable for use within Great Britain, but it will not be produced for export until the results of the present experiments have been received.

The future policy of the Imperial Chemical Industries will be to offer the agriculturist fertilizer in the form that is best suited for his individual case, according to reports. In addition to nitro-chalk experiments, arrangements have been made to test other new fertilizers.

Representatives of the I. C. I. have been sent to India to investigate the fertilizer position of that country, and to study the best means the company can use if called upon to give effect to the proposals laid before the Royal Commission on Agriculture in India for fertilizer co-operation between the government of India and Great Britain. Arrangements have also been made for co-operation between the Sudan government and the company with a view of carrying out fertilizer trials in the Sudan.

Mississippi Has Largest Baukite Deposit in the World

NEW mineral deposits and new minerals are constantly being found in the southern states. Only a short time ago the refractory mineral "baukite" was found in the Mississippi along the Gulf, Mobile and Northern railroad. This deposit, which is in Wintson county, is said to be the largest of three deposits of this material known to exist in the world.

Baukite is understood to be a non-spalling silicate and to offer a super refractory for furnace lining, glass pots and other uses wherever high heat resistance is desired. The discovery of this valuable mineral and its application to industrial uses is another indication of the growing development of the south's mineral resources. — *Manufacturers Record.*

[Baukite was discussed at the 1926 meeting of the southern division of the American Mining Congress, a detailed report of which was published in Rock Products, April 3, 1926.]

Editorial Comment

A Common Sales Problem

In these days of keen, and not always ethical, competition there is a tendency for the ties that bind individual producers to their trade associations to become strained to the point of breaking. Why? There is no logical reason, and there cannot be; for if there is ever a time when associated effort is valuable and helpful it is in meeting just such conditions and circumstances as over-production and demoralization of markets. Probably producers' associations should be and sometime possibly may be perfected to an extent that contingencies of this kind are foreseen and avoided in a legitimate way. But he is a short-sighted producer who would abandon the chief hope of untangling his present problems because he is peeved at the tactics of some of his competitors, or to "save" a few cents per unit of production in association dues.

The only ultimately satisfactory answer to over-production, or better over-capacity, is a larger market. And how are you going to get a larger market? Never by individual effort; not in this day and generation! Only through a carefully, thoroughly organized effort on the part of all producers can markets be expanded. It is a gigantic sales problem—the problem of selling 120,000,000 people *en masse* the desire to have things which require the use of your materials to make.

There has been a good deal of mystery and a great deal more "bunk" thrown out in connection with the promotion of public improvements. The public is so apt to connect public work of all kinds with politics, politicians and graft that the average man is probably doubtful of the motives of any one who urges an expenditure of public money for any purpose. Yet public opinion must be "molded" in nearly every community by some means, or the average run of citizen would never *demand* any convenience beyond a mud road and a backyard privy. (Iowa is a good example, right now!) Some one must lead in creating a *desire* for better things.

Is a man — a citizen — less public-spirited and less progressive and less entitled to credit because he may have a selfish interest also? Whatever public opinion may be, his own conscience need never trouble him provided the contemplated improvements are really in the public interest; and there have been mighty few paved roads, sewage systems, public water-supplies, and what not, which have not proved to be in the public interest. And public interest in the final analysis is nothing more or less than the selfish interests of a majority of the people. Then let the wide-awake producer associate himself with other producers and help solve this wholesale *sales problem*.

Elsewhere in this issue C. D. Franks, of the Portland Cement Association, tells what the steps and the process are in meeting this kind of a sales problem. No one can read his paper, which was delivered at the recent convention of the National Crushed Stone Association, without being impressed with the part played by *organization* in the success of such sales efforts. To get together and train an organization that can do a selling job of that kind successfully is something that only a strong, well-financed national association can hope to accomplish. To think that an individual producer can ever compete with that kind of sales effort is absurd. And without that kind of sales effort where are those larger markets to care for over-capacity coming from?

Activity in Sand Plant Improvements

Reports recently received by our research department from approximately 500 representative live producers of commercial sand and gravel, throughout the entire country, indicate that about 125, or 25%, are making extensive improvements to take care of the expected season's business. This fact is not presented as anything unusual, nor as evidence of the expectation of any more than a normal season's business. It does emphasize the constantly changing character of the business, and the continuing investment called for to keep plants abreast of the unbroken, growing demands for better and still better products.

This striving to make better products is further emphasized by the fact that the most popular improvements (6%) are the installations of new washing and screening equipment. Over 3% of those reporting—and all of those reporting, please note, are going concerns, not projects—are building entirely new plants, or completely rebuilding their old plants. Over 4% of those reporting are making extensive additions to floating equipment— dredges, barges, towboats, etc., involving the purchase of motive power equipment, pump, etc. Those who are installing crushing, elevating and conveying equipment account for another 5%.

All these data go to prove that a sand and gravel plant is never *completed*. It is one long series of plant renewals, changes and improvements. The man who goes into the business with a capital of $50,000 or $100,000 and no experience, expecting his investment to be good for a life of 10 or 15 years, almost invariably finds out that he must put in twice to three times what he originally expected to invest. He should take this into consideration when he sets out to make prices designed "to bust" his older and more experienced competitors, whose ever-changing plants may look rather dilapidated to his inexpert eye.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Allentown Portland Cement Co. (common)[27]	Dec. 30	.....	3	7	
Allentown Portland Cement Co. (6% bonds, 1932)[23]	Dec. 5	.....	90	92	
Alpha Portland Cement Co. (common)[2] new stock	Feb. 28	No par	36	39	75c quar. Jan. 14
Alpha Portland Cement Co. (preferred)[2]	Feb. 28	100	.....	115	1¾% quar. June 15
American Lime and Stone Co. (7% bonds, 1942)[23]	Feb. 24	.....	101¾	102½	
Arundel Corporation (sand and gravel—new stock)	Feb. 29	No par	47¼	47¾	50c quar.; $1 ex. Jan. 16
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Mar. 1	.....	109	112	
Atlas Portland Cement Co. (common)[2]	Feb. 11	No par	39½	41½	50c qu. Mar. 1
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% qu. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Feb. 28	33⅓	43	.....	2% qu. Jan. 3
Beaver Portland Cement Co. (1st Mort. 7's)[3]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (Class A)[4]	Feb. 29	.....	35½	36½	75c quar. Feb. 1
Bessemer Limestone and Cement Co. (6½% bonds)[4]	Feb. 24	.....	100¼	.....	
Boston Sand and Gravel Co. (common)	Feb. 23	100	77¼	80	$1 qu., $1 ex. Jan. 2
Boston Sand and Gravel Co. (preferred)	Feb. 24	.....	80	85	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)	Feb. 24	.....	90	95	2% qu. Jan. 1
Canada Cement Co., Ltd. (new common)	Feb. 29	.....	32	33½	
Canada Cement Co., Ltd. (new preferred)	Feb. 23	.....	99½	100	$1.62½ qu. Mar. 31
Canada Cement Co., Ltd. (new units)	Nov. 4	.....	107	107½	
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Feb. 23	100	96	99	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Feb. 25	No par	37	39	50c quar.; 50c ex. Jan. 12
Charles Warner Co. (preferred)	Feb. 25	100	108	.....	1¾% quar. Jan. 26
Cleveland Stone Co. (new stock)	Feb. 29	.....	74¼	80	50c qu. 50c ex. Dec. 1
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Dec. 30	100	Called		
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Mar. 1	100	94¾	98	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Mar. 1	100	95	98	
Consumers Rock and Gravel Co. (1st Mort. 7s)[13]	Feb. 10	100	99½	101	
Coosa Portland Cement Co. (6% bonds, 1944)[23]	Dec. 28	.....	65	75	
Coplay Cement Manufacturing Co. (6% bonds, 1941)[22]	Dec. 28	.....	50	.....	
Coplay Cement Manufacturing Co. (common)[39]	Dec. 20	.....	11	.....	
Dewey Portland Cement Co. (1st mort. 6's 1942)[30]	Mar. 1	100	99½	.....	
Dolese and Shepard Co. (crushed stone)[7]	Feb. 29	50	132	137	$2 Apr. 1, $1.50 ex. Apr. 1
Edison Portland Cement Co. (common)[29]	Feb. 24	.....	50c	.....	
Edison Portland Cement Co. (preferred)[29]	Feb. 24	.....	1	.....	
Edison Portland Cement Co. (bonds)[29]	Feb. 24	.....	75	.....	
Egyptian Portland Cement Co. 7% pfd.[21]	Feb. 23	.....	90	95	1¾% quar. July 1
Egyptian Portland Cement Co. (warrants)	Feb. 23	.....	No market		
Fredonia Portland Cement Co. (6½% bonds, 1940)[32]	Dec. 5	.....	97	101	
Giant Portland Cement Co. (common)	Feb. 28	50	35	45	
Giant Portland Cement Co. (preferred)	Feb. 28	50	40	45	3½% Dec. 15
Ideal Cement Co. (common)	Feb. 29	No par	97	99	$1 quar.; $1 ex. Jan. 1
Ideal Cement Co. (preferred)[33]	Feb. 29	100	109	111	1¾% quar. Jan. 1
Indiana Limestone 7's (1936)	Nov. 9	.....	98	100	
International Cement Corporation (common)	Feb. 29	No par	64½	65	$1 quar. Mar. 30
International Cement Corporation (preferred)[2]	Feb. 29	100	109	111	1¾% quar. Mar. 30
Kelley Island Lime and Transport Co. (new stock)	Feb. 29	100	50	52	62½c quar. Jan. 1
Lawrence Portland Cement Co.[2]	Feb. 28	100	109	112	2% quar.
Lehigh Portland Cement Co.	Feb. 11	.....	64	69	1½% quar.
Lehigh Portland Cement Co. (preferred)	Feb. 28	.....	107	108	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1928 to 1931)[12]	Aug. 12	100	99½	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1932 to 1935)[12]	Aug. 12	100	97½	99	
Marblehead Lime Co. (1st Mort. 7's)[14]	Feb. 24	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	Feb. 24	100	98	.....	
Michigan Limestone and Chemical Co. (common)[6]	Feb. 28	.....	40	.....	
Michigan Limestone and Chemical Co. (preferred)[6]	Feb. 28	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Feb. 29	25	38¾	39	50c Feb. 1
Monolith Portland Cement Co. (common)[9]	Feb. 24	.....	14¾	15¼	8% ann. Jan. 2
Monolith Portland Cement Co. (units)[9]	Feb. 24	.....	33¼	34¼	
Monolith Portland Cement Co. (preferred)[9]	Feb. 24	.....	9¼	9½	
National Cement Co. (7% bonds)[35]	Feb. 23	100	96	99	
National Gypsum Co. (common A)[25]	Mar. 1	.....	18	21	
National Gypsum Co. (preferred)[25]	Mar. 1	.....	65	70	
Nazareth Cement Co.[20]	Feb. 23	No par	32	34	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Dec. 30	.....	115	.....	
Newaygo Portland Cement Co. (6½% bonds, 1938)[32]	Feb. 11	.....	120	.....	
New England Lime Co. (Series A, preferred)[14]	Feb. 24	100	.....	95	
New England Lime Co. (Series B, preferred)[22]	Feb. 24	100	97	99	
New England Lime Co. (V.T.C.)[22]	Feb. 24	.....	32	36	
New England Lime Co. (6s, 1935)[14]	Feb. 24	100	98	100	
New York Trap Rock Corp. (6% bonds, 1946)[23]	Feb. 29	.....	101½	101½	
North American Cement Corp. 6½s 1940 (with warrants)	Feb. 29	100	88⅛	88½	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Jan. 28	.....	40	45	
North American Cement Corp. (common)[19]	Feb. 7	.....	8⅞	9	2 mo. period at rate of 7%
North American Cement Corp. (preferred)	Apr. 25	.....	.....	.....	
North Shore Material Co. (1st Mort. 6's)[18]	Mar. 1	100	99	101	1.75 quar. Aug. 1
Northwestern States Portland Cement Co.[37]	Nov. 21	.....	165	170	

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York.

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS (Continued)

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Pacific Portland Cement Co. (common, new stock)	Feb. 25	.....	23	24¾	
Pacific Portland Cement Co., Consolidated[3]	Oct. 21	100	61¾	.....	25c mo.
Pacific Portland Cement Co., Consolidated (preferred)	Feb. 25	.....	.....	80	
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[3]	Feb. 25	100	.....	99½	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Feb. 23	10	1	1½	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[29]	Feb. 29	100	98⅞	99	
Pennsylvania-Dixie Cement Corp. (preferred)[29]	Mar. 1	100	96⅜	.....	1¾% Mar. 15
Pennsylvania-Dixie Cement Corp. (common)[29]	Feb. 29	.....	24⅜	24⅝	50c April 1
Petoskey Portland Cement Co.[1]	Feb. 15	10	11¾	12½	1½% quar.
Pittsfield Lime and Stone Co.[21]	Oct. 8	.....	.....	100	
Pittsfield Lime and Stone Co.[21] (common)	Oct. 8	.....	.....	25	
Riverside Portland Cement Co.	Feb. 24	.....	187½	192½	50c monthly, $1.50 ex. Aug. 1
Rockland and Rockport Lime Corp. (1st preferred)[24]	Feb. 23	100	.....	100	3½% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (2nd preferred)[24]	Feb. 23	100	.....	65	3% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (common)[24]	Feb. 23	No par	.....	50	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	Feb. 29	100	170	170	$2 quar.; $4 ex. Jan. 1
Santa Cruz Portland Cement Co. (bonds)[5]	Feb. 25	.....	105⅝	.....	6% annual
Santa Cruz Portland Cement Co. (common)[6]	Feb. 25	.....	89	90	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	Feb. 25	.....	24½	25⅜	
Schumacher Wallboard Corp. (preferred)	Feb. 25	.....	.....	26½	
Southwestern Portland Cement Co. (units)	May 11	.....	205	.....	
Superior Portland Cement, Inc. (Class A)[30]	Feb. 24	.....	47½	48	
Superior Portland Cement, Inc. (Class B)[30]	Feb. 24	.....	34	36	
Trinity Portland Cement Co. (units of 1 sh. pfd. and ½ sh. com)[37]	Feb. 14	.....	154	160	
Trinity Portland Cement Co. (common)[37]	Dec. 19	.....	50	60	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	July 14	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	July 14	100	98	100	
United States Gypsum Co. (common)	Feb. 29	20	73	74	40c qu. March 31
United States Gypsum Co. (preferred)	Feb. 28	100	120	122	1¾% qu. March 31
Universal Gypsum Co. (common)[3]	Mar. 1	No par	.....	4¾	
Universal Gypsum V.T.C.[3]	Dec. 7	No par	3	3½	
Universal Gypsum Co. (preferred)[3]	Mar. 1	.....	.....	27	1½% Feb. 15
Universal Gypsum and Lime Co. (1st 6's, 1940)[3]	Mar. 1	100	68	73½	
Union Rock Co. (7% serial gold bonds)[13]	Oct. 7	.....	Called as of Nov. 1, 1927		
Upper Hudson Stone Co. (1st 6's, 1951)[23]	Dec. 28	.....	92	.....	
Upper Hudson Stone Co. (1st 6's, 1937)[22]	Dec. 28	.....	Called		
Vulcanite Portland Cement Co. (7½% bonds, 1943)[32]	Dec. 5	100	105	109	
Whitehall Cement Mfg. Co. (common)[38]	Feb. 24	.....	150	.....	
Wisconsin Lime and Cement Co. (1st Mort. 6's, 1940)[25]	Mar. 1	100	100	.....	
Wolverine Portland Cement Co.	Feb. 28	.....	6¼	6¾	15c Feb. 15
Yosemite Portland Cement Co. (Class A, common)	Jan. 4	10	6	.....	

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Asbestos Corp. of America (5 sh. pfd. and 5 sh. com.)[1]	June 22	.....	$1 for the lot		
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (50 sh. pfd. and 390 sh. com.)[1]	Dec. 29	.....	$400 for the lot	.....	
Blue Stone Quarry (60 shares)[2]	Mar. 16	.....	$10¼ for the lot	.....	
Coplay Cement Mfg. Co. (common)[4]	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred)[1]	Dec. 30	.....	70	.....	
Eastern Brick Corp. (7% cum. pfd.)[1]	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common)[1]	Dec. 9	10	40c	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phosphate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand and Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.)[1]	Mar. 17	.....	$12 for the lot	.....	
Knickerbocker Lime Co.(x)	June 22	.....	100	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼% semi-annual
Olympic Portland Cement Co.(g)	Oct. 13	.....	.....	£1⅝	
Phosphate Mining Co.[1]	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.)[1]	June 23	.....	$200 for the lot	.....	
Rockport Granite Co. (1st 6's, 1934)	Aug. 31	.....	90	.....	
Simbroco Stone Co.[2]	Apr. 20	.....	12	12	
Southern Phosphate Corp.[4]	Sept. 15	.....	1¼	.....	
Standard Gypsum Co. (10 sh. pfd. and 5 sh. com.)[1]	Dec. 28	.....	$35 for the lot	.....	
Tensas Gravel Co. (180 sh. com.)[1]	Nov. 17	.....	$1 for the lot	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd.)[4]	Nov. 3	.....	$1for the lot	.....	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick)[6]	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. [1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction byWeilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, Penn. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

Charles Warner Co. Annual Statement

THE FOLLOWING report made by President Charles Warner to the stockholders and directors of the Charles Warner Co. at the recent annual meeting has been received direct from the company:

The sales volume of sand, gravel and lime products held up well throughout the year 1927 and showed moderate increases over the preceding year.

The most important development step taken by our company during the past year was the acquisition of all of the outstanding common stock of the West Jersey Sand and Supply Corp. of Philadelphia, and the merging of the properties and business of that company with the Charles Warner Co. Our company had owned for several years one-sixth of the West Jersey corporation's stock. It was decided by the West Jersey officials and our officers that a better coordination between the production and transportation departments of the Warner company and the retail yards and distributing organization of the West Jersey corporation could be effected by complete merger, and this was accomplished by negotiating an exchange of common stock of the Charles Warner Co. for all of the remaining stock of the West Jersey corporation. By this step our company becomes a complete producing and distributing unit, from raw material to consumer, in the large Philadelphia markets.

The balance sheet and income statement in this report reflect the consolidated condition at the end of the year and the consolidated earnings for the full year of 1927. Due in part to the consolidation and in part to the improved earnings from Warner plants, the net earnings applicable to the common stock show a substantial increase for the year 1927, as compared with 1926. The increase in outstanding common stock, due mainly to the stock issue for the acquisition of the West Jersey corporation shares, amounted to 75% during the year 1927. The final net

earnings per share of common stock for the year 1926 were $3.17. The improvement accomplished in this respect for the year 1927 resulted in a net of $4 51 on the common.

During the year 1927 our company retired the balance of its convertible bond issue, which stood at $299,500 January 1, 1927. Upon calling this issue some of the holders exercised their conversion privilege into common stock and the balance was retired by cash payment. The operation of the first preferred stock sinking fund retired 500 shares of this issue during the year 1927, with an additional 591 shares early in 1928.

The new balance sheet printed herewith shows an item of mortgages payable of $240,000. This item represents three purchase money mortgages formerly issued by the West Jersey corporation in connection with their acquisition of valuable Philadelphia wharf properties. These mortgages were assumed by our company in effecting the merger, and represent the only fixed obligations prior to the common stock of the West Jersey corporation.

Business prospects for the year 1928 appear to be reasonably satisfactory.

CHARLES WARNER CO. CONDENSED BALANCE SHEET DECEMBER 31, 1927

Reflecting Consolidation With the West Jersey Sand and Supply Corp. (Inter-company Items Eliminated)

ASSETS

Cash		$ 294,934.00
Receivables		720,521.00
Merchandise (cost)		330,301.00
Total current assets		$1,345,756.00
Investments		$ 456,784.00
Real estate, buildings and equipment (depreciated value)		5,311,984.00
Prepaid expenses, incompleted repairs, etc., deferred to future operations		84,978.00
		$7,199,502.00

LIABILITIES

Bills payable		None
Accounts payable		$ 46,565.00
Accrued accounts including common dividend payable 1-12-28, preferred dividend payable 1-26-28 and federal tax		330,751.00
Total current liabilities		$ 377,316.00
Mortgages payable		$ 240,000.00
Reserves other than depreciation		524,615.00
First preferred stock		736,300.00
Second preferred stock		177,100.00
Common stock (no par value) 167,194 shares outstanding.		4,295,967.00
Surplus		848,204.00
		$7,199,502.00

GROSS SALES

Consolidated gross sales, including miscellaneous income for the year ended December 31, 1927, eliminating inter-company and inter-department items, amounted to	$5,614,352.46

CONSOLIDATED INCOME STATEMENT

(For the Year Ended December 31, 1927)
(Inter-company Items Eliminated)

Total earnings after deducting all expenses incident to operation, inclusive of general expenses, ordinary taxes, insurance, rentals and maintenances		$1,420,475.50
Deduct:		
Depreciation	$317,355.67	
Depletion	72,354.08	
Interest (net)	25,632.58	
Additional federal tax (prior years)	57,939.02	
Provision for 1927 federal tax	127,883.76	
		$ 601,165.11
Balance to credit of surplus, available for dividends or other purposes		819,310.39
Dividends paid to holders of first and second preferred stock		65,275.00
Balance available for distribution to holders of common stock or other purposes		$ 754,035.39

International Cement Earnings in 1927

THE INTERNATIONAL CEMENT CORP. reports for the quarter ended December 31, 1927, net income of $1,271,194 after depreciation, federal taxes, etc., equivalent after preferred dividends to $1.96 a share on the 562,500 shares of no par common stock outstanding. This compares with $1,234,973 or $1.89 a share in the preceding quarter and $1,164,010 or $1.76 a share in the corresponding quarter a year ago.

For the year ended December 31, 1927, net income amounted to $4,554,710 or $6.90 a share on the common stock against $4,348,551 or $6.51 a share in the preceding year.

The income account for the quarter ended December 31, 1927, compares as follows:

INTERNATIONAL CEMENT CORP. EARNINGS FOR FOURTH QUARTER, 1925 TO 1927

	1927	1926	1925
Gross sales	$7,189,535	$6,742,245	$5,161,694
Discts. allows., etc.	1,367,916	1,240,883	970,057
Mfg. Costs	2,921,407	2,736,422	2,123,833
Depreciation	506,571	401,197	287,076
Expenses	1,137,969	1,044,787	944,364
Net oper. prof.	$1,255,671	$1,318,956	$ 950,229
Fed. tax, etc.	*15,523	154,946	157,082
Net income	$1,271,194	$1,164,010	$ 793,147

*Credit.

INTERNATIONAL CEMENT CORP. EARNINGS 1925 TO 1927, INCLUSIVE

	1927	1926	1925
Gross sales	$29,323,150	$26,470,758	$21,559,723
Dis. allows., etc.	5,612,710	4,862,466	3,960,627
Mfg. costs	12,381,230	10,756,966	8,651,572
Depreciation	1,822,455	1,591,379	1,056,967
Expenses	4,201,106	3,957,030	3,201,907
Net op. prof.	$ 5,305,649	$ 5,302,917	$ 4,688,650
Other income	.....	.....	133,484
Total income	$ 5,305,646	$ 5,302,917	$ 4,688,650
Fed. tax, etc.	750,935	954,366	851,547
Net income	$ 4,554,714	$ 4,348,551	$ 3,970,587

Offer to Purchase Assets of National Cement Co. of Canada

ACCORDING TO REPORTS, shareholders of National Cement Co. (Canada) have been advised by Hon. Donat Raymond, former president of the company, to accept the offer of $90 for preferred and $10 for common shares made by Alfred Rogers, of the Elias Rogers Coal Co. and St. Mary's Cement Co. Senator Raymond stated that, in a contract dated January 30, 1928, he had agreed to deliver sufficient shares to at least represent control of the company within 15 days from the date of contract. To assure to all the shareholders the same price received by him and his co-directors, Senator Raymond stipulated that Mr. Rogers offer the same terms to shareholders for a period extending 30 days from the date of delivery of control. Shareholders, therefore, have until the middle of March to deposit their shares with the Royal Trust Co. for payment on this basis.

The assets consist of 7293 shares of preferred and 15,000 shares of common of National Cement Co., incorporated in 1925, which had been received by the old company in payment for its bonds which had been acquired by the 1925 company.

The price offered for the preferred is $90 and for the common $10 per share. From the proceeds of the sale are to be deducted the outstanding debts of the company, amounting to approximately $16,000, and the balance is to be divided pro rata between the holders of the two classes of security.

It was stated that in the winding up of the company, after payment of all expenses, preferred shareholders would receive approximately $89 a share and the common about $5 per share for their holdings.

U. S. Gypsum Co. Opposes Certain-teed Acquisition of Beaver Products Co.

THROUGH THE filing of a bill for injunction in the United States district court, the United States Gypsum Co. has taken steps to check the plans of the Certain-Teed Products Corp. to acquire the properties of the Beaverboard companies and Beaver Products Co. in a $47,000,000 merger. The three companies which plan to enter into the consolidation are made defendants in the action.

The United States Gypsum Co., of which Sewell L. Avery is president, asserts that under the merger arrangement it will be prevented from collecting royalties on Beaver wallboard. In 1926 the company agreed to accept these in settlement of a $4,000,000 claim for infringement of wallboard patents owned by the U. S. Gypsum Co.

The U. S. Gypsum Co. in the same year won its contention in the federal court that the Beaver Products Co. had infringed upon its patents. After this decision the litigation was ended by an agreement under which the Beaver Products Co. was to pay $250,000 in cash, plus a cash royalty of 5% on all its sales of wallboard up to August 1, 1929, and thereafter until 1937 a royalty of ½ of 1%.

In its plan to take over the Beaver properties the Certain-Teed Products Corp. agrees to assume the funded indebtedness against them. According to the U. S. Gypsum Co.'s contention, however, its claims for royalties would no longer be collectible once the properties pass out of the Beaver Products Co.'s possession.—*Chicago Journal of Commerce.*

North American Cement Earnings

NORTH AMERICAN CEMENT CORP., Albany, N. Y., for 1927 reports a profit of $828,364 after depreciation and depletion but before interest, amortization and federal taxes against $1,082,912 in 1926. For the quarter ended December 31, profit after the above charges was $132,362 against $129,423 in the fourth quarter of 1926.

Rock Products Subjects Discussed at Mining Engineers' Convention

Nonmetallic Section of the American Institute of Mining and Metallurgical Engineers Shows Renewed Interest

FOR THE FIRST TIME in two years the American Institute of Mining and Metallurgical Engineers took cognizance of the nonmetallic industries with a session devoted exclusively to them—indeed, for the first time in the history of the Institute there were two sessions, with a noon luncheon, the conference lasting all day. This was largely the work of the new chairman of the Institute's committee on nonmetallics, Dr. Oliver Bowles, of the U. S. Bureau of Mines, Washington, D. C., and the committee secretary, Arthur C. Avril, mining engineer, France Stone Co., Toledo, Ohio. Twenty-four attended the luncheon on Monday, February 20.

Sandstone Mining in Arkansas

D. D. Dunkin, president, Silica Products Co., Guion, Ark., presented a paper on "Mining and Preparation of the St. Peter Sandstone in Arkansas," read by W. M. Weigel, mineral technologist, Missouri Pacific Railroad Co., St. Louis, Mo. This paper is reproduced in full (less the illustrations) as follows:

"Sandstone has been prepared for glass-making purposes, and marketed from the White River Valley in Arkansas at Guion, Izard County, since about 1910—soon after the completion of the White River Branch of the Missouri Pacific Railroad Co. Until 1921, operations were somewhat spasmodic and ended in many failures. In that year a plant was built by the Silica Products Co., Inc., and since that time the operation has been continuous and steady.

"The land is held under leases, covering about 30 sq. mi. of the best sandstone adjacent to the railroad. Most of the product is shipped to glassmakers.

Geology

"The St. Peter sandstone is rather widely distributed in north central Arkansas and is exposed most prominently in outcrops along the slopes of the White River Valley and its tributaries that form the division between the Boston Mountains to the south and the Salem Plateau of the Ozarks to the north. It is of Ordovician age and is generally underlain by Cotter dolomite and capped by Plattin limestone, except in the vicinity of Bellefonte and Everton. At those places, it is a massive cross-bedded, laminated, saccharoidal sandstone; underlying it is the Everton limestone and overlying it, the Joachim magnesium limestone.

"The sandstone at Everton contains numerous phosphatic pebbles and inclusions of sandy limestone. The irregularity of cross-

George Otis Smith, president, American Institute of Mining and Metallurgical Engineers

section, the evidence of sorting action and the phosphatic pebbles appear to be indications of secondary deposition.

"The St. Peter sandstone occurs as a massive formation in the picturesque bluffs along the White River Valley from near the Eastern escarpment of the uplift northwestward into the Ozarks. The exposure shows a series of gentle anticlinal and synclinal folds. The greatest thickness is at the southeastern end, where it is over 100 ft. in many places. It thins out to the north and west and then to isolated and scattered deposits which cap the ridges and mountains of the Ozarks.

"The sandstone is saccharoidal and is either white or cream-colored. The grains are small and well rounded and of nearly pure silica. This is also characteristic of the St. Peter sandstone found at Pacific and Klondike, Mo., and at Ottawa, Ill. The binder holding the grains together consists of clay and lime and is more frail than the grains. The glass sands of Pennsylvania, Maryland and West Virginia are in the Oriskany formation of the Ordovician age. The grains of the Oriskany are small and angular and the binder is siliceous. The Oriskany carries rutile, but the St. Peter has comparatively little.

"The character of the St. Peter sandstone in Arkansas varies markedly even in short distances. Where it stands out in relief, without cover, the presence of many impurities is indicated. The better sandstone is protected from rapid erosion only by the overlying limestone cap. Faulting, with considerable movement, is in marked evidence. The grain size, texture and hardness of the rock is variable in any vertical section.

"Where the deposit is suitable for commercial use it is massive and there are few cracks, fissures or seams. Water does not easily penetrate the deposit, though the sand is damp, as is evidenced by springs at the contact of the overlying limestone.

"The St. Peter sandstone is generally accepted as a wind deposit, though this has been disputed. There are many markers at Guion that would indicate a water deposit. In working the deposit at Guion there is a vast difference between horizontal and vertical sections. The roof and floor of the mine follow very distinct lines of cleavage and the vertical sections show none. The roof and floor remain parallel. There are a few very distinct horizontal markers.

"There are very few ripple marks. The hardness and cleavage vary in any vertical section. The boulders produced by blasting can be broken only by means of a wedge, and this along a horizontal plane of the boulder as it was *in situ*. Along this plane, even in thin strips, the rock will bend and show considerable deflection before breaking.

"The results of chemical and physical tests on samples from the old quarry at Guion, which is 80 ft. high, are shown in Table 1.

TABLE 1.—TESTS ON SAMPLES OF SANDSTONE FROM QUARRY FACE AT GUION

Chemical Analyses

	Pct.	Pct.
Silica (SiO_2)	98.90 to	99.61
Alumina (Al_2O_3)	0.62 to	0.21
Ferric oxide (Fe_2O_3)	0.04 to	0.02
Lime (CaO)	0.42 to	0.08
Undetermined	0.02 to	0.08
	100.00	100.00

Sieve Analyses, on Tyler Standard Screens

	Pct.	Pct.
On 28-mesh (0.589 mm.)	0.2 to	1.2
Through 28 and on 35 (0.417 mm.)	9.47 to	21.0
Through 35 and on 65 (0.208 mm.)	30.20 to	31.2
Through 65 and on 100 (0.147 mm.)	31.52 to	10.0
Through 100	17.61 to	7.5

"In glass-sand practice, fines are defined as grains that will pass through a 100-mesh screen. All above 5% are objectionable for glass-making; the fines making seedy glass as well as being carried over by the draft to choke the checker work of the regenerators. The fines carry the bulk of the impurities.

Causes for Change from Quarrying to Mining

"Specifications for glass sand have become more strict on account of new machines for making window glass, and the placing of the manufacture under technical control. Keen competition has also had its effect. In addition to chemical purity, maximum and minimum grain sizes and grading from coarse to fine are important. "An ideal sand would be through 48-mesh (0.295 mm.) and on 58-mesh (0.233 mm.)." (Pebble.)

"A good glass sand, in addition to being pure, will pass through 28-mesh (0.589 mm.) with not over 5% through 100-mesh (0.147 mm.) with *uniformity of grain size* from shipment to shipment. Still further, the specifications of some users call for 60 to 80% retained on 65-mesh (0.208 mm.) with graduation in grain size uniform from shipment to shipment.

"These more strict requirements demand more careful preparation, and in order to continue with the quarry meant that the fines must be eliminated by some method. Fine screening was found to be a very difficult problem and also very inefficient. None of the reputable screen-makers cared to give any guarantees when screening finer than 60-mesh. All tests showed that the elimination of 15% of fines meant the loss of 15% or more of coarser material. Without the handling charge, the loss alone would increase the cost about 50%.

"To obtain a sand to meet the specifications outlined, it was necessary to start a systematic campaign of sampling on vertical sections of all deposits available to the railroad. The best results were obtained from the samples taken in the old quarry. Here, down from the top of the deposit 12 ft., a seam 16 ft. thick was found, which was uniform and persistent. The average chemical and sieve analyses of the seam are given in Table 2.

TABLE 2.—ANALYSES OF SANDSTONE SEAM IN OLD QUARRY

Chemical Analysis

	Pct.
Silica (SiO_2)	99.38
Alumina (Al_2O_3)	0.57
Ferric oxide (Fe_2O_3)	0.028
Lime (CaO)	0.01
Undetermined	0.012
	100.00

Sieve Analysis

	Pct.
On 28-mesh	1.2
Through 28-mesh and on 35	20.00
Through 35 and on 48	29.10
Through 48 and on 65	31.2
Through 65 and on 100	10.0
Through 100	8.5
	100.00

Mining Methods

"In order to get the sand from this seam, it was necessary to resort to mining. The entrance to the mine is by tunnel, the bottom of which is 20 ft. above the present quarry floor. The tunnel was placed to permit the grade to favor the loads and to provide natural drainage.

"The general scheme leaves about 60% of the sandstone in the mine as pillars to support the roof. The tunnel, or drift, was driven straight in, 16 ft. high by 40 ft. wide.

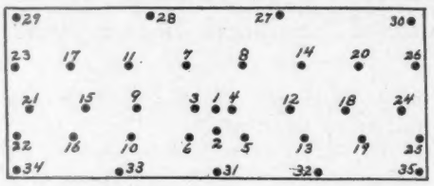


Fig. 1. Arrangement of holes and order of firing at the Silica Products Co. sandstone quarry, Guion, Ark.

As in coal mining, rooms are turned off this tunnel every 100 ft., the turn being narrower than room width; corresponding to the room neck in coal mining. This neck is about 25 ft. wide at the beginning and gradually widens to 40 ft. The rooms are connected by crosscuts which are 35 ft. wide and are 80 ft. apart. The mine has natural ventilation and numerous exits. A convenient bend in the mountain permits the rooms or drifts to be driven to the outside.

"There is a definite floor, to which all shots break. This floor is very hard and smooth, much like an artificial floor, though there are some undulations; it is composed of extremely fine sand grains, and particular care is used not to break into it. The roof follows a very definite line of cleavage; it is very smooth and much like the ceiling of a dwelling.

Drilling and Blasting

"The drill used is the Waugh 93 jackhammer, with air by-pass; designated as 'soft-ground hammer.' The ordinary jackhammer, piston drill, or water Leyner drill is not adapted for this work because the binder is more frail than the grain, the grains are not pulverized, and are of sufficient size to muck the steel. These types were all tried and discarded. Then a twist steel with an ordinary bull bit was used. It was better than the other drills but was not rapid enough. The rotation of the drill augered the cuttings from the hole.

"The Denver Rock Drill Manufacturing Co. assisted in working out this problem with twist drill steel and later brought out the Waugh 93 with air by-pass. With this drill it is essential to have a needle with a large hole and a large hole in the hollow steel. The steel in use is ⅞-in. hexagonal hollow steel with rose bit. The longest steel is 12 ft. and the gage is 1.5 in. The changes are every 2 ft., the gage enlarging by one-eighth.

"The drill is operated by using the hammer for a few seconds, pressing a button, which stops the hammer, and by-passing the air around the hammer and down the hollow steel, blowing cuttings from the hole.

"No breaks are maintained in room or drift. All holes are drilled straight into the face and all holes are 12 ft. deep. The holes next the pillar walls are gripped from 6 to 8 in. in 12 ft. Fig. 1 shows arrangement of holes and the order of firing. The top holes are drilled parallel with the room and about 6 in. below it. The same method of drilling and placing is used for the bottom holes. None of the holes are squibbed to make a pocket for additional dynamite. The first few holes fired have from one to three sticks of 60% gelatin dynamite in the back of the hole. The remainder of the hole is loaded with 40% extra gelatin.

Firing Order

"Holes 1 and 2 are fired first and make sufficient break to relieve Nos. 3, 4, 5 and 6. All the holes are fired with fuse and in rotation. No. 8 detonators are used. This round of holes yields from 400 to 500 tons of sand. If the steel is full length and the holes are fully 12 ft. deep, the tonnage is from 500 to 525 tons of sand. Little or no secondary or boulder popping is necessary.

"The average for a year showed 0.77 lb. dynamite to the ton of sand. At the beginning of this year a heading was carried at the top of the drift, about 6 ft. high, and the rest was lifted as a stope. There was the extra expense of mucking out for the driller so that the dynamite used early in the year was 1.05 lb. to the ton of sand. By carefully measuring the drift, spotting all holes and using extra precautions to get all the holes parallel, the dynamite now used is 0.42 lb. per ton of sand.

"This method of placing holes and shooting has the advantage of not shooting into pillars, because all shots are away from pillars. The roof is not 'burned' and full of pot holes, and the floor is very level. All pillars have vertical walls and an absence of talus accumulations. In all, it is about as ideal a mine as could be imagined. After two years of experience, there is no weakening of the pillars and, if anything, they are much larger than necessary. It is not the intention to change them until more years of experience can be used as a guide.

"The method of drilling is unique, as no post nor mounting of any kind is used. The top of the adjustable horse is a 12-in. board with the broad side up. The drill is laid on the board, with the driller sitting behind and advancing the drill with his feet.

"Usually two men operate the drill, though at times, after all the steel has been brought to the working face and pipe lines and connections made, each takes a drill to operate. One man has drilled 420 ft. of hole on a shift, each hole being 12 ft. deep. The average drilling is about 240 ft. per shift of 8 hr.

"This method of placing holes is a very radical departure from all approved methods, especially in getting the first break.

"The sandstone is shoveled into two-ton,

bottom-dump cars, two men to the car. All cars are equipped with Timken roller bearings. The track gage in the mine is 3 ft. The length of the car inside is 7 ft. and the width at the top is 41 in. The height of the car above the rail is 43 in. The distance between axles is 20 in. This makes a long low car and favors the shovelers. The grade in favor of the loads makes it necessary to equip all cars with brakes. The shovelers run their own cars to the storage bin outside the mine, leading a mule to the bin and using the mule to pull the empty back to the face. The storage bin is 100 ft. long and the track extends its full length, thus permitting dumping anywhere in this distance.

"The sand is removed from this storage by a hoe-type drag. The drag was designed by the company and is built at the plant. It operates below the track used for the dumping of the sand. The sand is dragged into a tram car and hoisted up an incline to the mill storage bin. The car automatically dumps into storage at the mill. Two men, one operating a Joplin-type drag hoist and the other a Joplin-type hoist, elevate 450 tons of sand per day.

Sand Preparation

"From mill storage, the sand is fed to a 16-in. Blake-type crusher—thence to elevator and to 30-ft. American Process-type rotary dryer. The setting and design of the dryer has been altered from the original design. The dryer is level instead of being on a pitch. To cause the sand to pass through, a series of wings are riveted to the shelves. These wings are in two sets placed 180 deg. apart and shaped so that the sand falling or sliding on to them strikes an angle of 45 deg., causing the sand to be advanced. With this arrangement, the dryer at 9 r.p.m. handles 40 to 45 tons per hour. The dryer is oil-fired and complete combustion is obtained in the dutch-oven combustion chamber, so that only the products of combustion are used dry the sand. From the dryer the sand is elevated and sent to two trommels in series, each 4x9 ft.

"There is enough oversize in the sand to keep the screens from blinding, even though these screens deliver a product that is all through 28-mesh (Tyler standard screen scale). The oversize passes to a small set of Cornish rolls and is returned to the screens. The throughs are elevated and sent to the grader, which removes the fines so that a product can be guaranteed to contain less than 5% of them. The fines pass to waste and the finished sand goes to storage bins.

"Railroad cars are carefully cleaned and paper-lined. Sand is loaded into them from storage bins by means of chutes, the storage being high enough to allow the sand to flow by gravity.

"Steam is used as the prime mover. A common slide-valve engine drives the mill and a compound steam two-stage compressor supplies air for the drills.

"The Silica Products Co., Inc., worked on the problem of fine screening for several years and had numerous tests made by the different manufacturers of screening equipment. The problem was the reverse of ordinary practice in that practically all the material passes over the screens with only 5% or less passing through. The wire cloth required was fine and frail, and even with the most intense vibration there was serious blinding. It was soon discovered that it was impractical to use cloth finer than 60-mesh, which did not give the desired separation. Also, the grains are too large to permit of successful air separation.

The Sand Grader

"To overcome the difficulty, a machine was developed for grading fine dry sand. Much of the credit for the final design is due to Supt. W. O. Tilton. Patent has been applied for. During the search for a method of separation, experiments led to the belief that each size of grain had a different coefficient of friction and if the sand could be fed on to a suitable surface in a ribbon-like stream, the coarser grains would slide and roll and the finer would adhere to the surface. This reasoning developed the idea of moving the surface up an inclined plane and thus removing the fines.

"The machine at present consists essentially of an endless belt operating over a system of rollers so that the slope and speed may be varied; also, different portions of the belt may have different angles of slope. The fines are discharged at the top of the belt and the coarse at the bottom, into suitable receptacles. The machine has a belt 7 ft. wide and a feed slot 5 ft. long. The capacity of each machine is 2.5 tons per hour. The fines will vary from 75 to 80% through 100-mesh. This makes the machine very efficient as compared to the ordinary method of fine screening.

"Another design has been developed, and patent applied for, in which more than one belt or inclined plane is employed. The slope and speed of each is independent of the other and more than one separation is possible, as each belt takes the fines from the preceding one and makes a further division."

Geology and Mining of Diaspore and Flint Clays

H. S. Queen, geologist, Missouri Bureau of Geology and Mines, Rolla, Mo., and C. R. Forbes, professor of mining, Missouri School of Mines and Metallurgy, Rolla, Mo., presented a paper, read by Prof. Forbes, on the "Geology and Mining of Diaspore and Flint Fire Clays of Missouri." This paper covered the same general ground (but more completely) as the article by J. H. Kruson, "Preparing Refractories for Rotary Cement Kilns," in Rock Products, Sept. 17, 1927.

These deposits are small and scattered and require rather unique methods of mining or quarrying. The diaspores and flint clays merge into one another and the raw product of blasting operations has to be hand-picked. Hand augers are used for blast-holing. The blast holes are approximately 15 ft. deep and are sprung with small charges of 40% dynamite, then loaded with black powder.

"A 15-ft. hole located 8 ft. from the face on the top, and with a 12-ft. burden on the bottom would be sprung with 4 to 8 sticks of dynamite and loaded with 20 to 25 lb. of black powder. Such a hole would break approximately 100 tons of clay. With a cost of 10 cents per pound for black powder and 20 cents for dynamite, the explosive cost would vary from 2.5 to 3.5 cents per ton. Dynamite of 20 or 30% grade is used in holes too wet to permit the use of black powder."

Cost Data

The following cost data may be helpful for comparative purposes:

"Most of the deposits in this district have been acquired by leasing. The royalties paid to owners depend on the distance from the railroad and size of the deposits. A common rate, in the past, has been 50 cents per ton for diaspore and 30 cents for burley clay for deposits 10 mi. or so from the railroad. The common form of lease calls for a minimum advance royalty of $100 per year, and the term of leases varies from 5 to 20 years.

"The mining of the diaspore, burley and flint clays in these small deposits is a comparatively simple operation. It is all small scale work; a production of as much as 100 tons a day is unusual, and more often only 40 or 50 tons are produced per day from one pit.

"Stripping: The first step in the mining of any of these deposits is 'stripping.' The brush and stumps are first removed, and then the overburden. On small pits teams and scrapers are used. The three-horse fresno is far superior to the ordinary slip for this work. Caterpillar tractors with fresnos are, of course, much more economical, but the initial investment may not be justified for the small operator.

"Stripping Costs: Stripping costs are difficult to give, as there are so many variable conditions affecting them. At one pit 3000 yd. were removed an average distance of 150 ft., with three-horse fresnos, at a cost of 60 cents per yard. The cost of driver and three horses was 80 cents per hour. No doubt this work could have been done more cheaply with tractors. This stripping was mostly red clay and soil and was not especially difficult. Plowing was done for the most part with two horses. The average depth was about 3 ft.

"Extent of Stripping: It is very desirable to strip the entire deposit as quickly as possible after opening it. At any rate, stripping should be kept at least 20 ft. back from a working face, and a ditch should be kept in the clay between the stripping and the working face to prevent water from running over the face.

"Mining Hillside Deposit: After the stripping has been carried back a sufficient dis-

tance, actual mining of the clay is begun. If the pit is a hillside deposit, it may be possible to open it by extending the face horizontally into the hillside. If the hill rises steeply, a suitable working face will soon be obtained. Until the face reaches a height of several feet the progress is very slow, and the cost excessive. If the deposit must be entered by a slope, it may be necessary to cut through the sandstone rim for the runway. A grade of 15% on the runway is desirable, but more often this grade is 25% or more. The height of bench to be worked will depend on several factors: The topography, the total thickness of the clay, the thickness of various seams of burley or diaspore clay, and drainage conditions are all factors affecting the height of bench. From the standpoint of safety and efficient blasting a face approximately 15 ft. high is desirable.

Cost of Mining

"The cost of drilling, blasting, sorting and loading onto trucks in the pit varies from 30 cents to $1 or more per ton, with a wage scale of 30 cents per hour for common labor and 35 cents for sorters. The lower figure obtains in pits producing only flint fire clay where no sorting is required and where all other conditions are favorable. The higher costs obtain where clays are badly mixed and other unfavorable conditions prevail. In narrow, deep pits where hoisting and pumping are necessary, the cost may be greatly increased. Also, the necessity of handling waste may greatly increase the total cost. Flint clay may have to be thrown on the dump if too far from the railroad. The total cost of production due to stripping, mining, hoisting, pumping and hauling waste may amount to $2 or $3 per ton under the most adverse conditions.

Haulage

"For hauling to the railroad, one-ton trucks loaded with two tons or more, are almost universally used. These trucks stand up remarkably well under this severe service. Hauling has been contracted on long hauls (over 10 mi.) at 15 to 20 cents per ton-mile on fairly good dirt and gravel roads. Where these low figures prevail, the contracts are usually to individuals who own and operate their own trucks. Company account hauling over fair roads can be done for 25 cents per ton-mile under favorable conditions.

"Team hauling still prevails in certain localities where roads are too bad for trucks. A good 'clay team' will haul loads of 5500 lb. and the contract price varies from 30 to 50 cents per ton-mile. In one instance the contract price on a 4-mi. haul was $1.20 per ton. A good team made two trips per day hauling 5500 lb. each trip, representing an earning of $6.60 for the day.

"Dump tracks afford considerable saving in unloading, especially into open cars. Much of the clay is shipped in box cars. It is necessary to shovel the clay back into the car. One man can 'shovel back' 40 tons into a car in 10 hr. if his loads are properly distributed.

"The extra cost of loading into box cars as compared to open cars when using dump trucks is approximately 10 cents per ton. In many places dump trucks are not used and the clay is shoveled from the trucks into the cars at an increased cost of 15 to 20 cents per ton as compared to dump trucks.

Marketing

"The most important problem of the clay producer is marketing his product. In a mixed pit he may produce diaspore, two grades of burley, and flint clay, and it is quite important for economical operation to be able to dispose of all of the different grades as mined.

"Flint clay price: Flint clay is quite plentiful, and the price varies from $1.35 to $2 per ton, f.o.b. cars, depending on the quality and size. At pits located over four or five miles from the railroad, it is usually necessary to waste this material.

Burley clay price: The price of first grade burley varies from $2.50 to $4.50 per ton, and second grade burley from $1.75 to $2.50 per ton.

"Diaspore is sold at $5 to $8 per ton, depending on the quality of the clay and size of the order."

Limited Resources

The main point brought out of interest to users of high alumina refractories—cement and lime manufacturers—is the rather limited resources of these materials. "The total tonnage of high-grade diaspore clay appears to be not over 750,000 tons, and at the present rate of consumption this will be exhausted within a few years, unless additional deposits are found. There is undoubedly a large but unknown quantity of burley clay in the district. Development of this material has just begun, and a large annual production may be expected in the future. The tonnage of flint clay in the field is large, but the low price of this clay makes mining impossible, except in deposits close to a railroad. As the reserves close in are exhausted outlying deposits will be worked. It is safe to predict that the tonnage of this clay is sufficient to meet the demands of the fire brick industry for many years."

Geology of the Pennsylvania Slate Belt

Charles H. Behre, Jr., associate geologist, Pennsylvania Geologic Survey, and assistant professor of economic geology, University of Cincinnati, Cincinnati, Ohio, presented a paper on "Geologic Factors in the Development of the Eastern Pennsylvania Slate Belt." This paper dealt not only with the geology of the section but with the application of geology to successful quarrying. For that reason the discussion is of much more general interest to the quarry industry than its title implies. The application of a knowledge of geology has led to mining rather than open quarrying in a number of instances.

Effect of General Structure on Quarrying and Mining

"If the beds are nearly horizontal, a large opening is likely to be made. In such a case, to work a valuable bed over its full extent, operations are carried on first by stripping until the desired bed or beds are reached, and then by quarrying laterally down the dip. At Bangor, where the beds lie flat, stripping and subsequent large-scale quarrying are the methods in common use, and here the quarries opened are of exceptional size; examples measure 1000 by 500 ft. (Consolidated Star quarry) and 1200 by 500 ft. (Old Bangor opening). At Pen Argyl similarly large openings are made, but here the size is due mainly to the great length of the quarries along the strike of the beds, the developing companies having bought up sufficient land in the early operating days to enable considerable lateral extension without infringing upon adjacent properties. As the beds at Pen Argyl stand nearly vertical, great depths are attained, the deeper quarries reaching 600 ft. At Slatington, on the other hand, the beds are also nearly vertical, but show repeated turns at shallow depths; further, the development is intensive so that only smaller holdings are available along the strike of the more valuable beds, and this has the effect of cutting down the strike length of openings. At the same time the valuable beds near Slatington are thicker and hence more sought after, and there is a general prejudice against taking out the thinly banded slate above and below the thick beds; hence relatively small openings are made at the surface, resembling large shafts rather than quarries, and frequently underground mining is actually carried on down the dip of the beds after exhaustion of that part of a stratum which can be removed by ordinary quarry methods. Sketch sections of such mining operations studied in 1927 are shown in Figs. 1 and 2, respectively.

At Slatington and Slatedale, many of the quarries practice a sort of underground mining intermediate between quarrying and room and pillar mining. Where the beds have inclinations of 40 deg. or so, they are followed on the slope, the roof consisting of the more closely ribboned slate which is not sufficiently valuable to justify removal. Large beds especially are worked in this way.

The advantage of underground mining in place of quarrying is obvious. There is little or no ice in the winter, the temperature is equable, and the men can continue to work in wet weather. On the other hand, no effort is made to ventilate, with the result that water vapor, escaping steam and smoke unite to confuse the sight. In addition, the roof must be carefully watched, as bedding planes are not infrequently parting planes and slides may well become dangerous.

"The Cambridge mine at Slatington, with about 300 linear feet of underground workings, is at present the most extensive operation of this type. This mine is electrically lighted. Its production supplies one selling company. Not far from it is the New York tunnel, a large mine, in which the accessible passageways alone total some 600 linear feet; much slate was taken out here, the chambers being opened on slight dips parallel to the beds. This mine is now abandoned.

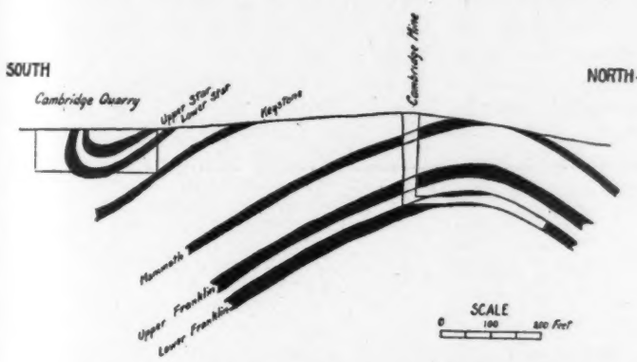


Fig. 1. Section through Cambridge mine, Slatington, illustrating method of following a bed down dip by slope mining

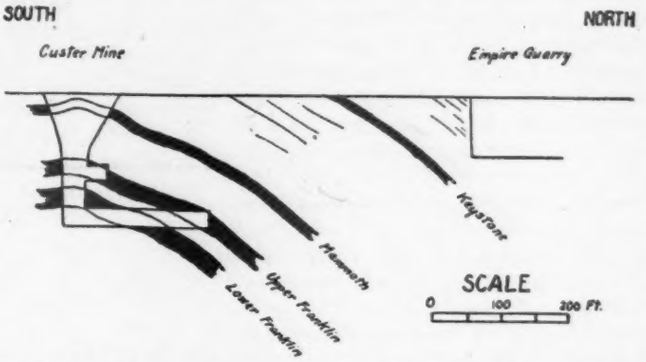


Fig. 2. Section through Custer mine, Little Run Junction, illustrating shaft approach in mining beds that do not outcrop

* * * * * *

Effect of Overburden

"A part of eastern Pennsylvania has been repeatedly invaded by the Pleistocene glaciers, with the result that the slate is frequently covered with an overburden that makes quarrying expensive and dangerous. At Slatington, the East End quarry was sunk through 35 ft. of glacial drift and several quarries northwest of the town encountered till and water-laid material that necessitated careful cribbing of the opening.

"This condition holds even more generally from Pen Argyl eastward, for Wisconsin glaciation affected the eastern part of Northampton County, leaving a heavy till cover. From the general neighborhood of Lynnport westward the glacial overburden is slight and slate is encountered only a short distance below the surface. Quarry owners are at times able to avoid the cost of stripping newly developed property by entering into agreements with highway contractors to furnish them with fill or road basing.

Effect of Jointing on Quarrying

"This has not been adequately considered by the average owner and operator. The feeling apparently is that joints follow no definite systems and cannot be predicted. In 1923 the writer studied two quarries in both of which the arrangement of joints was manifestly radial and upon this basis he recommended that quarrying be abandoned. The company operating one quarry subsequently failed and the other quarry, after changing hands, is being worked at a loss. Both openings were located in the troughs of folds whose axes lay at right angles to the monoclinal structure of the region; that is, these minor folds pitched northwest. It is apparent that transverse strains will be set up in such structures and these may be expected to find relief in joints whose patterns will only conform to the general joint patterns of the slate on the edges of the structure. Where two or more joints converge, V-shaped blocks will break out and the three corners of such blocks will all have to be discarded in trimming the slate to block size; the quarrying of such triangular blocks is therefore very uneconomical.

"Jointing of a different type is also noticeable along fault planes. In several quarries, as they were sunk downward, zones were encountered along which movement nearly parallel to the bedding and apparently subsequent to the development of the cleavage had taken place. The Bangor Superior and Albion quarries at Pen Argyl illustrate this type of fault. It has also been observed in the Peach Bottom slate district in southern Pennsylvania and the writer believes it to be more common than is generally recognized. Slate quarrymen frequently speak of such faulting as a "loose ribbon," but this term has been applied to other structures having a wholly different origin. When the movement took place the friction between the two sides opened numerous inconspicuous cracks which now break the slate into such small blocks that quarrying is not profitable for distances of 20 or 30 ft. on either side of the fault plane.

* * * * * *

Core Drilling

"Core drilling is the only method by which the slate operator, no matter how experienced, may assure himself of the favorableness of stratigraphic and structural conditions before opening. Drilling should be carefully carried out, the cost being regarded as a legitimate expenditure comparable to development work in a mining operation. In the Slatington district, where close folding makes the underground structure irregular and where it is desired especially to open only certain exceptionally thick beds, it is more generally practiced than elsewhere in the slate region. As recently pointed out by Dr. Bowles, it may serve another purpose, for drilled holes sometimes facilitate the drainage of quarries.

"In the Slatington district, shot drilling has been the form most generally resorted to. One or two among the experienced slate operators have from time to time contracted to drill exploratory holes on land of which the development was contemplated, thus carrying on a very useful type of consulting work.

Scientific Quarry Valuation

"Very little has been done in the slate quarries, either in Pennsylvania or elsewhere in the United States, in developing methods for quarry valuation. In advance of development, valuation contains a strongly speculative element, but after the opening has been made, certain reasonable assumptions are admissible for postulating definite quantities of available slate. Such estimates should consider the following factors:

"1. Total quantity of clear stock available, computed on the basis of a reasonable working depth.

"2. Total quantity of ribboned stock available, on the same assumption.

"3. Loss due to waste, taking into account irregularities in cleavage and jointing.

"4. Loss incidental to operation, taking into account method of opening (*i.e.*, whether by drilling, loosening with powder, or channeling) and waste in trimming blocks to proper size.

"5. Special factors enhancing the value, such as the use of certain beds for electrical or blackboard purposes.

Cost Accounting

"No quarries can be successfully operated over long periods of time without accurate cost-accounting methods. These are especially essential in fixing the price at which the slate is to be sold. Business management thus becomes a necessary prerequisite to successful quarrying. Not only does cost accounting give the final dependable criterion upon which to base the price of the product, but it is often the deciding factor in deter-

mining which of two alternative quarry methods is to be followed.

Conservatism in Opening New Quarries

"On the whole, there is a tendency toward conservative development in the slate district. But anyone well acquainted with the industry must realize that it is at present more nearly over- than under-developed. For that reason, caution is advisable. The extensive opening of new properties is to be discouraged rather than otherwise. It is believed that quarries in the 'hard' belt, which yield only roofing slate and very limited classes of structural slate, will generally operate at a disadvantage in comparison with those of the 'soft' belt, because there is so little opportunity to utilize material not suitable for roofing.

"It is true that the capital expenditure is less in 'hard' belt operations, because the 'soft' belt mill must be equipped with trimming, planing and dressing machinery; but these costs are at least equaled, if not overbalanced, by the sale of mill products. Those sections in the 'soft' belt where operations have been unsuccessful in the past, due to relatively poor slate, might better be left untouched until such time as the more readily quarried and more advantageously sold material is nearer exhaustion. The situation in slate quarrying recapitulates that in copper and iron mining, in which, until relatively recently, only the more high-grade deposits have been worked; as supplies go down and demand up, not only will the better grades of slate bring a higher price, but the insistence of a large class of consumers upon a cheaper product will permit the saving of much material of a sort that at present is discarded as waste because too closely 'ribboned.' The analogy would apply yet more strictly were it not true that there is no dearth whatever of slate and that the exhaustion of the higher grade material is not even faintly in sight."

Genesis of Grecian Magnesite

J. R. Thoenen, engineer, U. S. Bureau of Mines, Washington, D. C., read a paper, "Notes on the Genesis of Grecian Magnesite," which covered a very much debated point on the origin of magnesite deposits. The consensus of published opinion is that magnesite is formed by the alteration of serpentine rock by infiltration of water charged with carbon dioxide (CO_2) from above or below, and the solution of the magnesium as carbonate, which precipitates in cavities adjacent, above, or below. Mr. Thoenen suggested the possibility of a magmatic origin, or the intrusion of a magnesium ore magma into the older formation. This was debated at the meeting.

Idaho Phosphate Resources

G. R. Mansfield, geologist, U. S. Geological Survey, Washington, D. C., described a study of the Idaho phosphate deposits, mainly to classify the public land containing deposits, and to estimate the extent of the phosphate resources. The following data will prove useful to phosphate producers and prospective producers:

"The original phosphate withdrawals have been greatly modified as a result of this work and of similar work by the Geological Survey in adjacent states. In December, 1908, when the western phosphate reserve was created the Secretary of the Interior withdrew from all kinds of entry 4,541,300 acres in Idaho, Utah and Wyoming. On July 31, 1927, the total outstanding withdrawals, which now include some land in Montana, amounted to but 1,966,390 acres distributed as shown in the following table:

OUTSTANDING PHOSPHATE WITHDRAWALS, JULY 31, 1927

	Acres
Utah	301,945
Idaho	391,532
Wyoming	992,969
Montana	279,944
	1,966,390

"In addition to lands embraced in the outstanding withdrawals, 268,299 acres in Idaho, 25,293 acres in Wyoming, 3833 acres in Montana and 160 acres in Utah—297,585 acres in all—have been examined in detail and formally classified as phosphate land. The total classified and withdrawn lands in the western phosphate field thus amount to 2,263,975 acres.

"Estimates of reserves in the western phosphate field and the country as a whole are:

ESTIMATE OF PHOSPHATE ROCK IN THE UNITED STATES AVAILABLE DEC. 31, 1925

Eastern Field	Long tons	West'n Field	Long tons
Arkansas	20,000,000	Idaho	4,997,855,000
Florida	291,000,000	Montana	391,323,000
Kentucky	878,000	Utah	326,745,000
So. Car.	8,788,000	Wyoming	115,754,000
Tennessee	83,500,000		
	404,166,000		5,831,677,000
Less approx. quantity mined since 1906			350,000
			5,831,327,000
Eastern reserve as above			404,166,000
Total for United States			6,235,493,000

Value of Petrology to Quarrymen

G. F. Loughlin, geologist, U. S. Geological Survey, Washington, D. C. gave an exceedingly interesting extemporaneous talk on the "Value of Petrology in Quarrying and Use of Stone," illustrated by lantern slides. Petrology is the study of rock minerals by the use of the microscope; by its expert application quarry operators and construction engineers may be saved some expensive failures. As Mr. Loughlin has prepared a very elaborate discussion of this subject, especially for Rock Products readers, to be published soon, we will not go into details here.

Metallurgical Limestone

Oliver Bowles, supervising engineer, Nonmetallic Experiment Station, U. S. Bureau of Mines, New Brunswick, N. J., presented a paper at one of the sessions of the iron and steel groups on "Utilization Problems of Metallurgical Limestone and Dolomite." This paper covered much the same ground as the articles by Dr. Bowles in Rock Products, July 9 and July 23, 1927, on "Requirements of Metallurgical Limestone," but treated the subject from the angle of the user.

Informal Luncheon Discussion

The informal round-table discussion following the luncheon at the Engineers' Club was full of interest. A wide variety of subjects was brought up, chiefly having to do with the future of the nonmetallic section of the Institute. There is every prospect of making the Institute a common meeting ground to discuss technical and economic problems, trite to all the rock products industries, but hitherto lacking an association or society for their consideration.

Those present at the luncheon were:

Oliver Bowles, chairman, supervising engineer, U. S. Bureau of Mines, New Brunswick, N. J.

Arthur C. Avril, secretary, mining engineer, France Stone Co., Toledo, Ohio.

H. J. Brown, consulting engineer, Boston, Mass.

S. B. Kanowitz, sales manager, Raymond Bros., Impact Pulverizer Co., New York City.

W. R. Dunn, works manager, Vulcanite Portland Cement Co., Phillipsburg, N. J.

S. Warren Hartwell, chemist, Vulcanite Portland Cement Co., Phillipsburg, N. J.

R. J. Colony, Columbia University, New York City.

Frank C. Hooper, North River Garnet Co., North River, Vt.

R. W. Hyde, Dwight and Lloyd Metallurgical Co., New York City.

A. B. Parsons, associate editor, *Engineering and Mining Journal,* New York City.

F. T. Gucker, secretary-treasurer and general manager, the John T. Dyer Quarry Co., Philadelphia, Penn.

E. T. Wolf, E. I. du Pont de Nemours and Co., Wilmington, Del.

J. F. Lang, E. I. du Pont de Nemours and Co., Wilmington, Del.

A. T. Goldbeck, director, Bureau of Engineering, National Crushed Stone Association, Washington, D. C.

C. R. Forbes, professor of mining, Missouri School of Mines, Rolla, Mo.

F. P. Knight, Mineral Products Co., Bristol, Tenn.

G. F. Loughlin, geologist, U. S. Geological Survey, Washington, D. C.

G. R. Mansfield, geologist, U. S. Geological Survey, Washington, D. C.

W. M. Myers, U. S. Gypsum Co., New York City.

J. R. Thoenen, engineer, U. S. Bureau of Mines, Washington, D. C.

C. H. Behre, University of Cincinnati, Cincinnati, Ohio.

H. E. Brookby, consulting chemist and engineer, Chicago, Ill.

W. M. Weigel, mineral technologist, Missouri Pacific R. R. Co., St. Louis, Mo.

Nathan C. Rockwood, editor-manager, Rock Products, Chicago, Ill.

Long-Time Tests to Compare Various Coarse Aggregates

P. J. FREEMAN, chief engineer, Bureau of Tests and Specifications, Allegheny County Department of Public Works, Pittsburgh, Penn., in *Engineering News-Record*, of recent date, reports on long-time tests of concrete using various coarse aggregates, specifically to determine the relative values of the coarse aggregates. Hence, his tests and his conclusions are interesting to every producer. He writes:

"The tests reported in this article were conducted by the writer, then (1916) engineer of tests, Pittsburgh Testing Laboratory, and at the same time a member of Committee C-9 of the American Society for Testing Materials, which was formulating the present methods for laboratory practice in testing concrete.

"Purpose of Tests—The purpose of this series of tests was to:

"(1) Make comparison of the crushing strengths of air-cooled blast furnace slag, limestone, granite, trap-rock and gravel, when used as the coarse aggregate in concrete. Tests were to be made at the end of 14, 30, 60 and 180 days, 1, 2, 3, 4 and 5 yr. (later extended to 10 years).

"(2) Determine the corrosive tendency of sulphur in slag.

"(3) Determine the effect of sulphur and other elements on the durability of concrete up to the age of 5 years.

"(4) Determine the relative strength and durability of concrete made of high-magnesia low-lime slag and low-magnesia high-lime slag.

"Preparing the Specimens—All cement was purchased at the same time, and found to comply with the requirements of the A.S.T.M. in force in 1916. The entire amount of fine aggregate, a well graded sand representative of that which is at present used in the Pittsburgh district, was obtained at one time.

"As the various coarse aggregates were received they were separated into four different sizes by screening through iron plates having circular holes of the following diameters: 1½, 1¼, ½ and ¼ in. The different sizes were stored separately and then recombined by mixing equal quantities, by weight, of each size. This was done in order to put all of the different kinds of aggregate on exactly the same basis, since there was no uniformity in the grading of aggregates received from the widely separated localities.

"The proportions used were 1:2:4 by volume, the quantities for the batches being carefully weighed after the weight of the sand and the coarse aggregate had been determined. These weights were checked every day on account of the slight drying out from exposure to the air in the laboratory. The weight of the cement was taken as 100 lb. per cu. ft., which was laboratory practice at the time these tests were started. Preliminary tests had definitely indicated that the amount of mixing water affected the strength of the concrete, and accordingly great care was used to keep the amount of mixing water as low as possible. Since a definite amount of each graded coarse aggregate was used, there was some variation in the quantity of water necessary to produce a workable concrete, but the same degree of workability, as judged by the same experienced operator, was used with all aggregates. The concrete was rodded into the steel molds in the manner which is now customary, and the molds were removed at the end of 48 hours.

"All specimens were stored in damp sand for 35 days; from this time on, the storage was in a dry warm basement laboratory until the end of the 5-year period. After 5 years, all specimens except those for series P (Table II) were placed out-of-doors. Specimens in series P, which had been made as a preliminary set of tests from the same material as B, were stored in dry air until

TABLE I—CHEMICAL ANALYSES (PER CENT) AND WEIGHTS OF SLAG

Sample	A	B	C	D	E	G	H	L	M
Silica	35.35	36.72	34.35	31.98	35.74	33.63	35.55	31.53	35.15
Alumina	12.28	12.81	13.55	12.25	11.81	13.41	12.04	12.39	14.11
Iron oxide	0.90	1.50	1.02	2.00	0.38	1.25	0.62	0.50	0.25
Manganese oxide	0.50	0.61	0.71	0.34	0.70	0.40	0.36	0.22	0.43
Titanium oxide	0.40	0.33	0.50	0.30	0.30	0.40	0.40	0.55	0.45
Calcium oxide	40.05	40.98	45.80	31.75	42.65	39.18	41.35	32.78	38.75
Magnesium oxide	8.20	5.14	1.62	19.43	6.18	9.31	8.45	18.24	8.84
Sulphur in calcium sulphide	1.05	1.29	1.10	0.89	1.26	1.03	0.73	0.89	1.11
Sulphur in calcium sulphate	0.52	0.27	0.41	0.27	0.24	0.20	0.50	0.10	0.17
Sulphur in other forms	.....	0.12	.....	0.07	.....	.....	0.05	0.18	.....
Weight, lb. per cu. ft.	66	78	79	64	75	64	84	74	82

TABLE II—COMPRESSIVE STRENGTHS (LB. PER SQ. IN.) OF SLAG, STONE AND GRAVEL CONCRETE

Results, except at 10 years, the average of 3 specimens

Sample Number Specimens 8x16-in. Cylinder	Coarse Aggregate	Weight per cu.ft. of Concrete	14-Day	30-Day	60-Day	180-Day	1-Yr.	2-Yr.	3-Yr.	4-Yr.	5-Yr.	10-Yr.	
A	Slag, Cleveland, Ohio, central furnace	135	1941	2525	2930	3753	4498	4537	4222	4143	3742	5300 5326	5313
B	Slag, Duquesne, Penn.	140	2159	2657	3117	4315	4725	4882	4541	4545	4266	6000	6000
C	Slag, Youngstown, Ohio	140	2134	2657	3306	4154	5028	4678	4129	4459	4225	6000 5760 5652	5804
D	Slag, Mayville, Wis.	135	2206	2653	3403	4309	5050	4894	4694	4979	4265	6000 4960	5480
E	Slag, Sharpsville, Penn.	140	2484	3075	3365	4803	5388	4740	5269	5396	4653	*	*
F	Gravel, Pittsburgh, Penn.	148	2046	2510	3295	3969	4627	4264	4097	4177	3556	5488	5488
G	Slag, Cleveland, Ohio, Cleveland furnace	144	2257	2844	3288	4394	4956	4974	4746	4850	4574	5718	5718
H	Slag, Ensley, Ala.	143	2109	2752	3289	4451	5105	4810	4714	4427	4048	*	*
I	Trap rock, Birdsboro, Penn.	156	2063	2386	3360	4819	4950	4448	4405	4497	3735	5360	5360
J	Gravel, Akron, Ohio	146	1795	2078	2554	3627	3673	3576	3257	3305	2550	4742	4742
K	Granite, Stockbridge, Ga.	149	2122	2292	3043	4151	4633	4482	4161	4503	4042	6000 5640	5820
L	Slag, Pottstown, Penn.	136	2187	2650	3289	4184	4649	4718	4619	4672	3966	*	*
M	Slag, East Toledo, Ohio	143	1942	2536	3103	4164	4787	4912	4819	4585	4298	*	*
N	Limestone, Gates City, Ala.	150	1713	1988	3082	4127	4344	3932	3783	3925	3445	4985 5592	5289
O	Dolomitic limestone, Cleveland, Ohio	150	1804	2360	3604	4724	4904	5260	5454	4913	3856	5951 6200 6698	6283
P	Slag, Duquesne, Penn.	.....	Same physical properties as No. 8, but storage conditions different; samples broken at age of 7½ yr. Average strength 3410 lb. per sq. in.									5366 5912	5639

7½ years, when three specimens were broken; the remaining cylinders were then stored in the weather until 9 2/3 years, when they were placed in damp sand until tested at the age of ten years.

"*Results*—The strengths, as given in Table II, represent the average of three specimens. The variation from the average was small and for that reason the individual tests are not included in the table. The mean variation for the one year's test was 2.65%, which is representative of all of the other results.

"All concrete, regardless of type of coarse aggregate, increased in strength when stored in dry air up to the age of 1 year, and after that time decreased in strength so long as the air storage continued. This relationship is borne out by other investigators. The strength of the concrete was regained after storage in the weather, and at the end of 10 years it has exceeded in strength the results obtained at 1 year.

"About one-half the slag-concrete specimens were made from slag produced by the quick cooling process in pits from which the slag is shipped within a few days after it comes from the furnace. The remainder of the specimens were made from slag which had been seasoned in banks for a period of 6 months in some cases, and as long as 15 years in one case.

"Concrete made from slags coming from furnaces many hundred miles apart, varying widely in chemical analyses and also varying considerably in weight per cubic foot, did not vary in strength in proportion to either the weight or percentage of any chemical constituent.

"The results of all tests, taken as a whole, indicate that all the aggregates tested are capable of producing concrete having a strength considerably beyond the requirements of commercial practice.

"Specimens of reinforcing steel embedded in samples of the concrete showed no indication of corrosion. Examined at the end of 5 years, slight rust spots were found where air pockets had formed next to the steel, but these were common to all the aggregates."

Crystal Silica Sand Co. Opens Plant at Oceanside, Calif.

THE new plant of the Crystal Silica Sand Co. has recently begun production at Oceanside, Calif. This plant is said to be the largest as well as the most modern silica sand plant in western United States, having a maximum daily capacity of 350 tons of washed sand. The plant is laid out to make the most possible use of gravity for conveying, and is entirely operated by remote control from central operating panels. The opening of the new plant was celebrated with a large barbecue and other special entertainment at the plant, sponsored by the Oceanside Chamber of Commerce and aided by the same bodies of San Diego and Los Angeles. J. A. Benell is president of the Crystal company.

Herzog Company to Make Quarry Improvements

AN improvement program involving an expenditure of approximately $120,000 is soon to be carried out by Herzog and Son of Forest, Ohio, at its quarry and lime plant near Kenton, Ohio, according to a recent announcement by officials of the company. The improvements are expected to increase the production capacity of the quarries to three times the present volume. The installation of a 42-in. gyratory primary crusher and of a 24-in. secondary crusher is included in the program and preliminary work on the installation of the larger crusher has already been started with the preparation of foundations. It is reported that the improvements are all to be completed within the next four months.—*Marion* (Ohio) *Star.*

National Asbestos Co. Opens New Mill in North Carolina

THE National Asbestos Co. has recently completed a new mill at Plumtree, N. C., and the plant is now producing 30 tons of asbestos fibre daily. The mill building is 90x85 ft. and is equipped with a 150-hp. boiler and engine. The production is said to be suitable for wallboard, plaster, stucco, boiler covering, furnace lining, paints, insulating compounds and other uses requiring a heat or electric resistant. It is white, free from silica and foreign matter and is produced in four grades, according to the length of the fibre. The company's mines, which are located on the Appalachian Scenic Highway, are equipped with air drills and hoists. —*Manufacturers Record.*

Geology of Northeastern Virginia

THE Virginia Geological Survey has recently published a bulletin by Dr. John T. Lonsdale on the "Geology of the Gold-Pyrite Belt of the Northeastern Piedmont Virginia." While this bulletin was issued primarily as a discussion of the gold-pyrite formations of the region, there is much contained in it concerning the general geology of the region. The final section of the report is devoted to a discussion of the quarries of the area, which produce granite and other rock for building stone and road material. Attention is also directed to a considerable amount of available gravel in the region, and another section of the book is devoted to the soapstone deposits in the territory. This area, covering portions of a number of counties in northeastern Virginia, presents an interesting location for the study of geological formations.

Wisconsin Court Dismisses Charges of "Combine"

THE suit brought by Edwin A. Nast, a minority stockholder in the Western Lime and Cement Co., against the members of the Wisconsin Lime Manufacturers Association, charging curtailment of production to boost prices, was dismissed recently by Circuit Judge Walter Schinz at Milwaukee. The court ruled that the organization was not operating in restraint of trade by fixing prices and curtailing production. Specifically Mr. Nast sought the return into the treasury of the Western company of 73,000, which he charged was paid by the association to Rufus C. Brown, Oshkosh, as trustee of the association.

Nine lime companies in the state and seven directors of the Western company were named defendants in the suit. It was contended by the complainant that the association spent large sums of money in buying up plants, dismantling them and then leasing them for the purpose of cutting down production. The counsel for the defendants contended that the association never existed and that in 1921 all activities of the alleged association were discontinued. Since Mr. Nast did not come into possession of stock in the Western company until 1921, defense attorneys argued that the activities of the alleged association prior to that time were immaterial.—*Milwaukee* (Wis.) *Journal.*

Gravel Company to Start Operations at Monroeville, Ala.

THE Monroeville Sand and Gravel Co. of Monroeville, Ala., a recently formed organization, is preparing to begin operations near Monroeville shortly. The company has obtained an option on a number of acres of land containing good sand and gravel deposits, and one or more gravel washing plants will be constructed on the property. It is contemplated that a concrete products plant will also be established by the company, and the aggregate from the sand plant will be used in the production of various concrete building units.

Vermont Marble Co. to Build New Plant in Cleveland

THE Vermont Marble Co. has let the contract for a $100,000 plant and office building on a one and a half-acre site in a new industrial community in Cleveland to the H. K. Ferguson Co., contractors of Cleveland. Plans of the Vermont company to move and expand its plant are the result of the sale of the old plant to the Nickel Plate railroad for its new east side right-of-way. Increased production is planned in the new plant. A. T. Howe is manager of the Cleveland branch. A siding from the Erie railroad, running directly into the shop, will provide the plant with excellent shipping facilities.

Eugene Holland to Head Universal Gypsum

ANNOUNCEMENT of a change in management featured the recent annual meeting of stockholders of Universal Gypsum and Lime Co. in Chicago. Eugene Holland, president of the Holland Lumber Co. of Omaha, Neb., has been elected president and general manager of the gypsum

Eugene Holland, new president of the Universal Gypsum and Lime Co.

organization following the resignation of L. M. Palmer, Jr.

The new president, Mr. Holland, has had wide and successful experience in the retail lumber business. After several years with another firm, he organized in 1917 the Holland Lumber Co. at Lincoln, Neb. In 1923 the business branched to Omaha and in 1926 to Sioux City, Iowa. Headquarters have been maintained at Omaha, Neb.

Mr. Holland has been a prominent business man. He is a member of the board of directors and the executive committee, as well as chairman of the aviation committee of the Omaha Chamber of Commerce. His retail building material experience is of great value to the Universal company, as he takes to the larger organization the viewpoint of a merchandiser. He is unusually well qualified to carry on the dealer-sales policy of the Universal company in marketing its plaster, gypsum wallboard, Insulex and other gypsum products.

Universal Gypsum and Lime Co. recently announced the acquisition of the Higginson Manufacturing Co. with the gypsum plant at Newburgh, N. Y., 270 acres of gypsum deposit at Windsor, Nova Scotia, and a lime plant at Ossining, N. Y., which rounded out a complete line of gypsum products for the markets in the eastern states.

In the southwest, the installation of a modern lime hydrator and other equipment of latest design at the Oglesby, Texas, lime plant provides for the production of bulk, masons' hydrated and lump limes. Production there will supplement the manufacture of gypsum products at the Rotan, Texas, plant. Continued production at the Fort Dodge, Iowa, and Akron, N. Y., gypsum plants and the York, Penn., and Oranda, Va., lime plants completes the extensive program of this company's distribution of recognized materials.

Lowell M. Palmer, Jr., who is retiring as head of the company, has long been a prominent figure in the lime industry. He was president of the Palmer Lime and Cement Co., with plant at York, Penn., and general offices and warehouses in New York City, prior to the purchase of the control of the Universal Gypsum Co., by the Palmer estate, when Mr. Palmer became the president of the combined organization. It is reported that Mr. Palmer intends to make his home abroad.

Photo by Blank and Stoller, New York

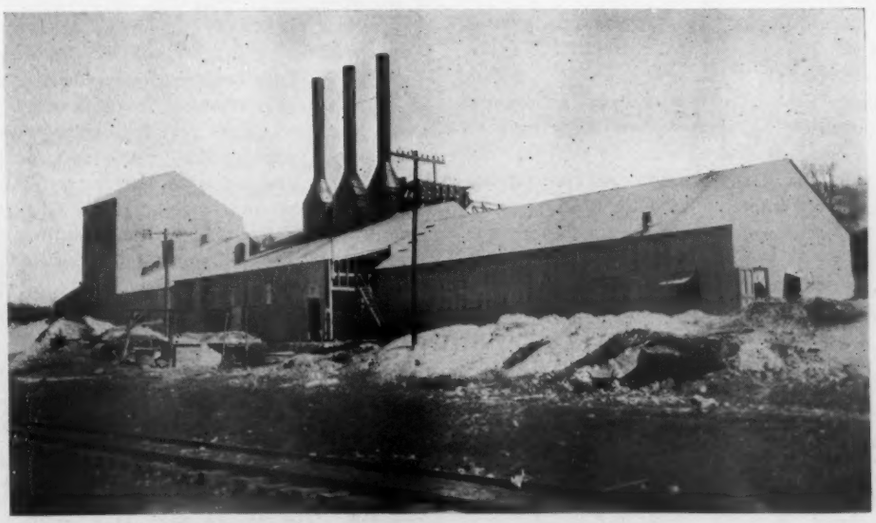
Lowell M. Palmer, Jr.

Iowa Sand and Gravel Spending $70,000 on Improvements

IMPROVEMENTS are being made at the plant of the Iowa Sand and Gravel Co. at Eddyville, Iowa, which will increase the production of the plant 50 to 100%. Additional ground has been leased and work will start immediately on the construction of a two-mile narrow gage railroad along the Des Moines river, between the main plant and the new auxiliary pumping, screening and dewatering plants up the river. Workmen are also busy at the main plant rebuilding and repairing in preparation for the coming season. The Iowa company shipped more than 4000 carloads of gravel from its Eddyville plant last year and it is expected that the improvements will increase the production at least 2000 cars per year. The estimated cost of the work now in progress is 70,000. It is reported that the tract acquired by the new lease gives the company access to more than 2,000,000 tons of material.—*Eddyville* (Iowa) *Tribune.*

American Sand Association Annual Meeting

THE annual meeting of the American Sand Association was held in Cleveland, Ohio, on February 22. R. G. Hay of the Ayers Mineral Co., Zanesville, Ohio, was elected president; L. R. Farrell, Portage Silica Co., Youngstown, Ohio, was named vice-president, and Hubert B. Fuller continued as secretary and general manager. The association maintains its executive offices in the Guardian building in Cleveland.



New lime plant at Oglesby, Tex., to be operated by the Universal Gypsum and Lime Co.

Tidewater Gypsum Co. Formed to Work Dome Deposit Near Houston, Tex.

THE Tidewater Gypsum Co. was recently incorporated to work a salt dome deposit near Houston, Texas. The chief organizers are connected with the Trinity Portland Cement Co. of Dallas and Houston. J. J. Horgan, purchasing agent of the Trinity company, is president of the Tidewater company. The other officers are: Harry K. Johnson, vice-president; Howard Kenyon, vice-president and manager, and J. E. Brown, secretary-treasurer. All but Mr. Horgan, who lives in Dallas, are residents of Houston. Mr. Johnson is prominent as a financier who has interests in many lines of business, Howard Kenyon is president of the Howard Kenyon Dredging Co. and Mr. Brown is at the head of the Bildo Supply Co.

The deposit which is to be developed and worked does not at all resemble the great gypsum deposits in the western part of Texas. It is on top of a salt dome, such as has been successfully drilled for oil in many parts of the Texas coastal plain. The presence of gypsum has been known there for a considerable time but the deposit was not worked on account of the difficulty of securing the land in an oil country, and for the further reason that attempts to work salt dome gypsum deposits before had encountered a great deal of water.

This deposit, however, is much higher than others which have been prospected, as it stands 192 ft. above the level of Houston, which is well above tidewater. The company has control, by lease or otherwise, of a large tract covering some thousands of acres. It is near the Southern Pacific railway and by laying a few miles of track other railroads can be reached. Houston is only 33 miles distant, and from Houston deep water transportation may be had to any part in the world.

Core drillings have shown that the gypsum is 900 ft. thick and that it lies 132 ft. below the surface. Above it is a strong cap rock which will make a good roof for mining operations. A shaft is now being sunk by the company and this should penertate the gypsum in a short time. The ground has been well explored by core drills and the cores analyzed so that the quality of the material is known. Samples have been sent to cement companies and commercial testing laboratories, and all have reported that the gypsum content is between 98 and 99%, with less than ½% anhydrite. The highest report was from the Pittsburgh Testing Laboratory, which found 99.30% gypsum in its sample. The laboratory of one of the largest cement companies reported 98.58% gypsum with 0.47% anhydrite in the sample it analyzed.

The financing of the company is complete, and it is the intention to erect a modern wall-board, plaster and gypsum products plant when the deposit has been sufficiently developed to warrant it. In addition to manufacturing gypsum the company expects to develop a large market for raw gypsum in the cement plants of Texas and the gypsum and cement plants along the Gulf Coast and the Atlantic coast, which it can ship to cheaply by water. The export market for gypsum products is growing rapidly and the company is well placed to make export shipments. In addition to a large supply of material and good shipping facilities, the company has the advantage of cheap natural gas and petroleum for fuel.

It is quite probable that the new company will ship considerable of its product to the western hemisphere, which is already a large user of gypsum products.

Pyramid Portland Plant To Be Sold at Auction

THE $2,000,000 plant of the Pyramid Portland Cement Co. at Valley Junction, Iowa, is to be sold at auction March 31 under foreclosure proceedings brought by first mortgage bondholders, whose claims on principal and interest amount to $1,056,000. Sheriff Park A. Findley of Polk county will have charge of the sale. H. M. Poole, receiver, was appointed October 25, 1927, and the bondholders through their bank, the Iowa Trust and Savings, brought foreclosure proceedings when the firm defaulted on $300,000 bonds. The Pyramid plant is one of the largest in the state, having a capacity of 3000 bbl. a day, and the Pocahontas quarries, which the company owns, are valued at $100,000. The Pittsburgh-Des Moines Steel Co. is the largest individual bondholder.

Date of Florida Rock Products Co. Sale Announced

THE bankruptcy sale of the Florida Rock Products Co. of Brooksville, Fla., has been scheduled for April 20 at the office of Hon. H. P. Baya, referee in bankruptcy, Tampa, Fla. This company formerly operated a limestone quarry and crushing plant in Hernando county, one mile outside of Brooksville. The stone of the quarry is Tampa limestone, practically the only limestone in the state suitable for the production of commercial crushed stone similar to the stone found in other sections of the United States, so that this sale furnishes an excellent opportunity for crushed stone producers who are desirous of expanding their opportunities. It is stated that the company's property will be sold as a complete unit. A full description of this plant and quarry was published in Rock Products in the issue of June 26, 1926, shortly after the plant was completed. The trustee for the company during bankruptcy is L. L. Buchanan, of the firm of Buchanan and Crowden, of Tampa.

Black Marble and Lime Co. Completes New Plant at Enterprise, Ore.

THE Black Marble and Lime Co. has completed the construction of its new lime plant near Enterprise, Ore., and is now preparing to commence operations. The new plant covers an area of 120x170 ft. and will have a capacity of 600 bbl. per day. The stone used for the production is the waste from the company's black marble quarries three miles away. At present a truck with two trailers will deliver nearly 100 tons of marble daily to the plant, but it is proposed to erect an aerial tramway, costing approximately $100,000, between the quarry and the plant, when the sales of the company justify the expenditure. The company recently increased its capital stock from $250,000 to $350,000, to cover the cost of the improvements.

Existence of Cement Monopoly Denied by Public Roads Chief

THERE is no evidence of a cement combine to inflate prices in the United States, Thomas MacDonald, chief of the Bureau of Public Roads of the Department of Agriculture, told the House of Representatives committee on roads on February 6.

"Prices for road materials are ruled solely by supply and demand," Mr. MacDonald said. "We carry heavier loads on less expensive roads than any other country in the world. We are perfecting the types of construction toward smaller initial costs and less maintenance costs. In the second place, due to our research work, types of roads that cost less are carrying heavier loads than ever before."

The chief of the Division of Tests of the Bureau, E. F. Kelly, described important physical investigations now under way.

Contract Let for New Crushing Plant of Sturgeon Bay Co.

A CONTRACT was recently let to the Leathem D. Smith Dock Co. by the Sturgeon Bay Co. of Sturgeon Bay, Wis., a subsidiary of Dolomite, Inc., Maple Grove, Ohio, for the fabrication and erection of the steel work for the company's new crushing plant on the site of the former plant of the Leathem D. Smith Stone Co. The work is expected to cost in excess of $50,000, and will probably be completed within the next two months. At the same time considerable new equipment is to be installed at the Sturgeon Bay quarry, and a new Bucyrus 120-B electric shovel is to be placed at the plant within a short time.

It is reported that the Sturgeon Bay company expects to operate two shifts of 120 men each as soon as the weather permits to care for the demand for stone in that section of the state.

Marble Cliff Company to Open Quarry at East Fultonham, Ohio

ACCORDING to an announcement made recently by Russell Rarey, sales manager of the Marble Cliff Quarries Co. of Columbus, Ohio, that company has acquired approximately 300 acres of land near East Fultonham, Ohio, and plans to open up a new quarry on the property. A modern crushing plant will be built having a daily capacity of 1500 tons of commercial stone and agricultural limestone. Much of the stone will be used for highway work, as there is considerable need for such stone on the roads in the vicinity. The new plant will be located to the west of the present plant of the Columbia Cement Co., a division of the Pittsburgh Plate Glass Co. of Pittsburgh, Penn. Since the Columbia company produces only stone for the cement mill, the Marble Cliff plant will be the first to produce commercial stone in the territory. The plant will have a connection with the Zanesville and Western railroad, which will provide an adequate outlet for the products. It is not yet announced when the work of constructing the new plant will be commenced. —*Zanesville* (Ohio) *Recorder.*

New Crushing Plant Being Built at Ottawa, Kan.

A NEW rock crushing plant is being erected by W. C. Hill of Kansas City, Mo., about two miles east of Ottawa, Kan. The new crusher is primarily to supply the demand for ballast stone on the Missouri Pacific railroad, but it is expected that some stone will be produced for local use for building and road work. At present a spur line is being constructed from the Missouri Pacific tracks to the plant, a distance of nearly a mile. The new crushing plant will have a capacity of approximately 10 carloads per day.—*Ottawa* (Kan.) *Herald.*

Adams Brothers Company to Build Sand Plant at Coshocton, Ohio

THE Adams Bros. Contracting Co. of Zanesville, Ohio, has purchased the Dickerson farm near Coshocton, Ohio, on the Warsaw-Coshocton road, and will construct a complete sand and gravel washing plant on the property, according to a recent announcement by F. S. Armbruster, superintendent for the contracting company. Work on the $25,000 plant will be started at once. A track connecting the plant with the Walhonding branch of the Pennsylvania R. R. will be laid to provide rail transportation for the plant. The company will also sell its products to local consumers, and plans to supply the sand and gravel to be used for the construction of paving on the Warsaw-Coshocton road, as the company has the contract for this work.—*Coshocton* (Ohio) *Tribune.*

Earl Glass Expands His Activities

THE SOUTHERN CALIFORNIA ROCK PRODUCTS ASSOCIATION announces the removal of its offices to larger and better quarters at suite 438 Bradbury building, Los Angeles, where E. Earl Glass will continue as general manager for the rock producers and of several other trade groups now organizing with his assistance.

E. Earl Glass

Mr. Glass has been engaged in some of the largest engineering projects in the southwest since coming to southern California nearly 30 years ago and is well known among the engineering fraternity and the construction industries. He is president of the Los Angeles chapter of the American Association of Engineers.

Before accepting the management of the sand and gravel association work he was for several years executive secretary of the southern California chapter of the Associated General Contractors of America, doing much good work for the advancement of the contracting business and for closer cooperation between members of the most competitive of all businesses, lump sum bidding for building and public work.

After this experience and nearly three years more in close contact with the diverse and peculiar problems of the sand, rock and gravel men, Mr. Glass seems to feel equal to anything in the line of trade associations brought before him, and is expanding his field of operations to include all comers.

Thompson-Williston, Inc., to Build Rock Plant at Chipley, Fla.

ACCORDING to a report in the *Jacksonville* (Fla.) *Times-Union*, the Thompson-Williston Mines, Inc., is preparing to locate near Chipley, Fla., to quarry lime rock products for use in the construction of roads and for building materials. The report states that the survey of the new location for the rock crushing plant has been completed, and the engineers are now working on the plans for the plant buildings and the spur tracks. It is expected that actual construction work will commence during March. The plant will employ about 60 people when completed.

Putnam Sand Co. Builds New Plant at Salina, Kan.

THE Putnam Sand Co. of Salina, Kan., has just completed a new screening and washing plant at its pit at Salina, and has already begun shipping from the new plant. The new plant, which was built by John Powers, Salina engineer, is reported to be thoroughly modern and efficient in every respect. Mr. Powers is also superintendent of the Putnam plant. The company at present is contemplating the installation of a small rock crusher to complete the equipment of the plant.

Acme Gravel Co. to Build Distributing Plant in Oakland

THE Acme Gravel Co. has purchased property in Oakland, Calif., for the immediate construction of a modern sand plant to cost approximately $100,000. The plant will consist of a group of eight concrete bunkers of the silo type, with automatic elevating machinery. There will also be batching and measuring apparatus, warehouses and a modern office building. The entire structure is to be of structural steel and reinforced concrete. W. H. Ford is president of the Associated Gravel Co. as well as of the Acme Gravel Co.—*Oakland* (Calif.) *Bay View News.*

American Refractories Institute to Meet in May

AN announcement has been received from the secretary of the American Refractories Institute of Pittsburgh, Penn., stating that the annual meeting of the Institute will be held this year at White Sulphur Springs, W. Va. It will be a two day session on May 8 and 9. The American Refractories Institute is a national organization promoting the interests of manufacturers and consumers of refractory materials.

Foreign Abstracts and Patent Review

Resistance of Cements to Aggressive Solutions. All acids are destructive to concrete; all bases are without effect and salts are partly destructive and partly harmless. Only inorganic salts soluble in water have a detrimental effect—particularly the sulfates of calcium, magnesium, sodium, potassium and ammonium and also the chlorides of magnesium and ammonium. Dense concrete and a protective coating are the best guarantees of resistance to such aggressive action.

Tests made by different German investigators—Michaelis, Gary, Gassner, Grün, R. Dyckerhoff and others lead to the following conclusions:

Only the absolute resistance of cement to salt solutions is of importance to the builder, as relative resistance means only a deferred failure. In waters whose aggressive action varies, such as sea water, density and treatment are of importance.

Portland cements with high silica or high iron oxide content and low alumina content are resistant cements even when low in lime. Portland cements with average silica, alumina and iron oxide content must have a hydraulic modulus not greater than 2.0. High alumina portland cements (8 to 9%) may be advantageously mixed with trass. The lime content alone is no criterion of the resistance of a cement to aggressive solutions. —*Zement* (1927), 1190-92.

Soluble Silica and Magnesia Cements. Silica in its soluble form is used to improve the density in magnesia cement. When used for this purpose in magnesia cement products it is important that no elongation be produced in the units due to this admixture. Accordingly measurements were made to determine whether silica or precipitated silicic acid presented the greater advantage.

The tests showed that with increasing concentration of the caustic solution, the silica admixture gave reduced elongation changes, whereas precipitated silicic acid increased this effect.

As precipitated silicic acid is capable of increasing the density of magnesite, but with effect not as marked as that of silica, the conclusion is drawn that silica possesses special properties which are not entirely of chemical nature, but rather of the physical-chemical origin. — *Tonindustrie - Zeitung* (1927) 100, 1812-13.

Modern German Automatic Shaft Kilns. In most instances throughout Germany, dolomite is still burned in intermittently operated shaft kilns, similar to lime kilns, or in straight shaft kilns with cylindrical shaft, which is jacketed to protect the dolomite lining.

Great improvements are claimed for the Mannstaedt kiln manufactured by the Klöckner Werke A. G. in Troisdorf, which is said to be adaptable for the cement industry as well. Essentially the advantages are said to consist of:

1. Uniform air distribution throughout the kiln due to central admission of air under the grate.
2. Admission of the combustion air at high pressure permits reaching the required high temperatures most economically.
3. Completely airtight discharge of the burned dolomite without pressure variations or change in the temperature of the kiln.
4. Uniform operation of the roller gates of the grate over the entire cross section, causing no accumulations in the sintering zone.
5. No crushing of the burned dolomite by the rollers to cause excessive fines in the dolomite. The finished product corresponds to the size desired or to the clearance between rollers.
6. Substantial construction, no sensitive parts, bearings or supports inside the kiln; the only parts located in the interior are the heavy, slowly revolving cast iron rollers.

The lower part of this automatically operated kiln, consisting of rollers, discharge and high pressure blast, is built into a rectangular concrete base. The metal cylinder lined with dolomite lining rests on this base. The air is admitted at the center by a high pressure fan and enters through a special air cap, which is patented by the firm. This center admission of air is claimed to be an advantage over the sideways admission, which is said to give undesirable air currents in the discharge hopper and uneven penetration of air into the kiln, most of it entering along the sides. The special air cap transforms most of the air velocity into pressure, producing uniform pressure in the hopper and forcing the air to enter the kiln uniformly through the slits between the rollers.

Two such kilns were built three years ago by a plant in Westfalia. The clear shaft diameter was 2.5 m. (8 ft. 2 in.) and the effective shaft height 12 m. (about 40 ft.). Dolomite coming from the quarry is fed into these kilns alternately with coke by one man. Special attention is paid to even distribution of the coke; the layers are limited to 50 mm. (about 2-in.) to obtain best results.

Attempts have also been made to operate such kilns with coke or blast furnace gases, which are always at the disposal of steel mills. Due to the very high heat consumption, however, the quantities of gas required are excessive and necessitate too large cross sections. Gas firing is to be rejected when dealing with sintering, as the gas flames burn holes into the sintering charge, thus producing a poor and irregular product.

The height of air pressure is determined by the behavior of the material in the sintering zone, the fan working as a rule at 300 to 600 mm. (water seal). The two kilns mentioned amove maintain a pressure of 400 mm. (water seal).

The fuel (coke of 10,400 B.t.u.) consumption is reduced in this kiln from 42 lb. to 32-34 lb. per 100 lb. of dolomite made. The capacity of the kiln is from 50 to 60 tons of dolomite daily, equal to the daily output of 4 to 5 old-fashioned kilns. The easy regulation of this kiln is said to permit reduction of output in times of lower demand. — *Tonindustrie - Zeitung* (1927), 65, 1145-48.

Setting and Hardening of Cements. The author (Dr. R. Nacken) after a thorough x-ray study of the constitution of cements confirmed his joint researches with Dr. W. Dyckerhoff that dicalcium silicate in a metastable form is the carrier of the properties of portland cement. He also made a study of the setting and hardening processes on two cements: a standard portland cement made by Dyckerhoff and Sons Co. and the Elektro Alca cement, a high alumina cement fused at 1600 deg. C.

The processes involved are attributed to colloid chemistry, similar in many ways to formations such as sandstones, whose cementing material at one time must have presented colloidal structure and acquired crystalline structure only after a long time, i.e., originally a highly disperse system, it has in time become transformed into a coarse system. The conditions controlling an intimate reaction of the individual particles are:

1. The gas absorbed at the surface must be eliminated.
2. The substance producing the gel must acquire hardness with time, yet develop no cracks.
3. The evolution of the substance should not be too rapid nor too slow.
4. The cementing material must be present in a finely divided state offering a maximum of surface area for reaction.
5. The solution medium must be eliminated or must react with the constituents. In clay the water is eliminated mainly by evaporation; in gypsum and other minerals in which the water is chemically combined, the reaction takes place with the solution medium and fine needle crystals appear and in cement a combination of the above processes take place.

The specific colloidal phenomena are transition phenomena, the colloidal dispersions presenting the central stage. Its characteristic properties are absorption of substances, ability to acquire color, peculiar sheen and opalescence. Silica flakes are disperse systems of a spongy structure, the silica skeleton being full of hollow channels filled with water.

Colloidal coagulation is accompanied by electrolytic action. The positive metal ions and the negative acid ions produce the gel of disperse systems by neutralizing each

other and either becoming precipitated as flakes or forming a gelatinous mass of a spongy structure. The valence of the anion is important—the higher the valence, the more rapid the reaction. Thus if one molecule of Al is required for coagulation, the same change can be produced only by 20 times that amount of a bi-valent and 350 times that amount of mono-valent metal.

Cement has all the requirements of a colloidal tendency. In this respect the alumina and silica constituents are particularly active. During setting each particle of clinker becomes coated with silica gel as a result of hydrolytic dissociation. At first this gel is closer to the sol stage, but eventually becomes transformed to a solidified gel.

Direct observation of the setting process consisted in observing the behavior of water in cement throughout the different stages. The analysis of a cement at least one year old gave a water content of 20.6%. Assuming that 100 gm. cement were mixed with 30 gm. water, this initial percentage must have been 23%. Thus nearly all the water is retained in the cement either as water of hydration or contained in the gel. Only 2% water is lost in heating to 110 deg. C. Only heating to a red heat causes the loss of the remainder.

Further tests were made to determine the loss of water in its relation to the period of time elapsed from the time of mixing. A torsion scale made by Hartmann and Braun in Frankfurt a.M. was used. The loss of water in per cent was determined upon heating to 110 deg. C. at periods ranging from 5 minutes to 1 year after mixing. While the values for standard portland cement are subject to considerable variations during the first minutes, those for Alca cement vary uniformly. In both cements rapid reaction of water during the first minutes is notable. This is followed by a standstill for about one hour and after 6 to 7 hours the activity is again increased. The variation of the results for portland cement are due to the fact that in its case homogeneous mixing with water presents more difficulty, as it is not as finely ground as Alca cement. The standstill after about one hour is probably due to considerable separation of the gel after water has been absorbed by hydrates. The gel prevents further reaction of the clinker particle until its coating is removed. The reaction then sets in again. It proceeds very rapidly, as the loss of water drops to one-half. From this point on the reaction with water remains more or less constant, at least only insignificant variations are recorded after several weeks. The gel coating becomes more solid and acquires greater thickness, so that reaction with the clinker particles continues only through diffusion.—*Zement* (1927), 1017-24, 1047-51.

Strength of Beams Made from Plaster Mortars. The International Association for Testing Materials appointed its Committee 42 in 1907 for the study of cements. The committee was short lived as it ended its activities in 1914. The following conclusions are quoted from its report at the 1912 convention submitted by Prof. F. Schüle:

1. The flexural strength of a test beam under concentrated load applied at the center of the span is greater and the individual error smaller than in the case of a constant breaking moment.

2. The concentrated load should be applied on a side surface of the beam. The flexural strengths thus determined are higher than on the bottom surface and lower than on the upper surface, thus yielding an average.

3. Mixing by hand or mechanical mixing has no appreciable effect on the strength of the resultant beam.

4. The average error of strength values of beams expressed as per cent of the average strength is: for mortars of standard (10% water) consistency—tension, 6.2%; compression, 3.6%; for mortars of plastic consistency (11% water)—tension, 4.9%; compression, 2.9%.

5. Tests covering a period of two years show that beams made from plastic mortars yield a higher percentage of increase in compressive and tensile strength.

6. Tests made by R. Feret on beams of 1:3 mortar made with two different brands of portland cement and German, French and Swiss standard sand show that the bending and compressive strengths vary according to a fixed ratio, numerically expressed.

7. Tests of the effect of type of sand on compressive strength, made using 12 different portland cements and German and Swiss standard sand, showed that no difference could be observed between bending and compressive strength.

Further tests were urged at the Zürich convention in 1913 and a program of tests were outlined to be carried out by 11 laboratories outside of Germany and by 10 German laboratories. The results of these tests of 1913 and 1914 together with investigations completed in 1924 and 1925 are given below:

1. The average maximum discrepancies, as well as the average values of average discrepancies of the strength values obtained on different cements *using the two consistencies,* are slight when the absolute values are considered.

2. The average values of average discrepancies in strengths between the different laboratories are slight in both cases.

3. The average values of discrepancies of laboratory averages from the general average are the same for both methods.

4. The general average of specified bending and compressive strength for the two methods varies by not more than 8%.

It thus appears that tests of beams made of plastic mortars might well replace the unnatural requirement of dry tamped compression cubes and tension briquets.

The arguments in favor of cement tests on mortar specimens of plastic consistency may be summarized as follows:

A. The cube and briquet specimens do not truly reproduce conditions on the job.

B—1. The fundamental idea of a constant amount of ramming given to the dry mix is incorrect. It is quite difficult to reach the same compactness with a very dry mix.

2. The abnormal tamping effect results in changes of the physical properties of sand in both tension and compression specimens.

3. The abnormally compacted mortar attains very high strengths at the outset, but the process of hardening cannot develop as naturally nor as rapidly as in the case of plastic consistency.

4. The variation of strength values of beams made from plastic mortar is very slight; as a rule it lies within 3%.

5. In the case of the dry rammed specimen, the quantity of mixing water is determined by the ramming apparatus. In the case of plastic consistencies it can be given numerically for a certain brand of cement or may be computed by Feret's formula.

6. A difference in specific gravity of portland cement of ± 0.10 affects the compressive strength of beams made from plastic mortar only by ± 6%.

7. Variations of the specific gravity of standard sand of ± 0.05 affect the compressive strength by about ± 4%.

8. Slight variations in the weight of dry substance of about 2.5% per beam result in variations of compressive strength of only 10 to 11% in the case of plastic mortar.

9. Shrinkage may be better observed on mortar of plastic consistency.

10. The elastic moduli show a more rapid increase in time than those of specimens of dry consistency.

11. Plastic mortar beams may be made in the laboratory without the aid of the ramming apparatus.

12. The sensitiveness of Feret's formula is of advantage, as it permits to observe the effect of temperature, moisture conditions and curing with age on the different mortar constituents.

Tests of bending and compressive strength show that the required strength in compression would have to be reduced by 40% should plastic consistency specimens be definitely adopted in the standards. No doubt the cement manufacturer might have objections to this, but the lower values would be closer to actual conditions and would tend to make cement users more careful when dealing with lean mixes.—*Zement* (1927) 1141-48, 1173-76.

Porous Cement Products. Tiles or sheets of material suitable for use as insulators against heat and sound are prepared from mixtures containing colloidal solutions worked up to a froth with cement, gypsum, etc. The colloidal solutions are prepared, *e.g.,* by vigorously stirring mixtures of solutions in alcohol or acetone of resins, cellulose esters, phenol-formaldehyde condensation products, rubber, etc., with solutions containing formaldehyde and such substances as glue, casein, dextrin, starch, etc. Frothing can be improved by the addition of saponin, soap, etc. *French Patent No.* 606,042.

Traffic and Transportation

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Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Jan. 28	Limestone Flux Week ended Feb. 4	Sand, Stone and Gravel Week ended Jan. 28	Sand, Stone and Gravel Week ended Feb. 4
Eastern	1,793	1,749	1,695	1,469
Allegheny	2,885	2,549	1,746	1,608
Pocahontas	181	148	379	453
Southern	536	480	9,006	8,470
Northwestern	526	581	1,381	1,715
Central Western	426	387	5,306	4,894
Southwestern	445	400	4,504	4,525
Total	6,792	6,294	24,017	23,134

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

District	Limestone Flux 1927 Period to Date Feb. 5	Limestone Flux 1928 Period to Date Feb. 4	Sand, Gravel and Stone 1927 Period to Date Feb. 5	Sand, Gravel and Stone 1928 Period to Date Feb. 4
Eastern	10,507	8,374	7,041	8,578
Allegheny	15,598	13,019	10,762	9,165
Pocahontas	657	1,060	1,786	1,747
Southern	2,354	2,480	49,336	41,670
Northwestern	3,619	2,673	8,157	5,815
Central Western	2,052	1,870	23,476	24,262
Southwestern	1,166	2,054	18,295	20,041
Total	35,953	31,530	118,853	111,280

COMPARATIVE TOTAL LOADINGS 1927 AND 1928

	1927	1928
Limestone flux	*35,953*	*31,530*
Sand, stone, gravel	*118,853*	*111,280*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning February 25:

TRUNK LINE ASSOCIATION DOCKET

17585, Sup. 1. **Ground limestone**, carloads, minimum weight 50,000 lb., from Paxtang, Penn., to Myerstown, Penn., inclusive, to Ancram, N. Y., ground limestone, 22c per 100 lb.

17820. **Sand, blast, foundry, glass, molding or silica**, carloads (See Note 2), from West Winfield, Penn., to Phillipston, Penn., $1.35 per ton of 2000 lb. Reason—Proposed rate compares favorably with rate from Manorville, Falls Creek and Pittsburgh, Penn., to Phillipston, Penn., and from West Winfield, Penn., to Cowanshannoc, Penn., as per P. R. R. G. O. I. C. C. No. 14726.

17838. **Fluxing limestone**, carloads (See Note 2), from Myerstown, Penn., to Etna, McKeesport, Pittsburgh, West Homestead, Penn., $1.51, and Youngstown, Ohio, $1.76 per ton of 2240 lb. Reason—Proposed rates are comparable with rates on like commodity from Annville and Palmyra, Penn., to same points of destination.

17846. **Marl and ground limestone**, carloads, minimum weight 50,000 lb., from Salisbury, Md., to N. & W. Ry. stations, St. James, Md., Rippon, W. Va., Gaylord, Stanley, Roanoke, Norfolk, Va., and various, rates ranging from 7c to 17c per 100 lb. Reason—Proposed rates are fairly comparable with rates now in force from Martinsburg, W. Va., as per B. & O. R. R. I. C. C. 21047.

17374, Sup. 1. **Ground limestone**, carloads, minimum weight 50,000 lb., from B. & O. R. R. kilns as shown in Note 72 of Agent Curlett's I. C. C. A193 and in B. & O. R. R. I. C. C. 21047, to Summerville to Clarion, Penn., inclusive, 18½c, and to Alton Mine to Alsace, Penn., inclusive, 19½c per 100 lb.

17721. **Furnace limestone**, carloads (See Note 2), from Stephens City, Va., to Uniontown and Scottdale, Penn., $1.40 per ton of 2240 lb. Reason—Proposed rate is comparable with rate now in effect from Stephens City, Va., to Pittsburgh, Penn., as per Item 2665 of Agent Curlett's I. C. C. A193.

Note 1—Minimum weight marked capacity of car.
Note 2—Minimum weight 90% of marked capacity of car.
Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

17725. **Sand and gravel** (other than blast, engine, glass, molding or foundry), carloads, minimum weight 100,000 lb., from Bragers, Md., to Hanover, Penn., $1.20 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Bragers, Md., to York, Penn., and Union Bridge, Md.

17726. **Agricultural, land, chemical, gas or glass lime**, carloads, minimum weight 30,000 lb., and **ground limestone**, carloads, minimum weight 50,000 pounds.

From	Prop. Rate
Ashcom, Penn., to Elmira, N. Y.	15½
Ashcom, Penn., to Horseheads, N. Y., to Canadaigua, N. Y.	16
York, Penn., to Ralston, Penn., to Fassett, Penn.	15½

Rates in cents per 100 lb.
Reason—Proposed rates are comparable with rates now in force from Martinsburg, W. Va., as per P. R. R. G. O. I. C. C. 14567.

17731. **Crushed stone**, carloads (See Note 2), from Jamesville and Rock Cut, N. Y., to Gilbert, Vineyard Siding, Kindaia and Yale, N. Y., $1.60 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodity to Covert, Interlaken, Sheldrake Springs, N. Y., and various.

17738. **Marble, broken, chips, crushed, dust, rubble and waste**, carloads, minimum weight 50,000 lb., from Pleasantville, Patterson and Wingdale, N. Y., to Paterson, N. J., 6c per 100 lb. Reason—Proposed rates are comparable with rates from Wingdale and Pleasantville, N. Y., to Delawanna and Passaic, N. J.

17750. **Ground limestone**, carloads, minimum weight 50,000 lb., from Ashcom, Penn., to Cumberland, Md., 6c per 100 lb. Reason—Proposed rate is comparable with rates now in effect to Martinsburg, W. Va., as per B. & O. R. R. I. C. C. 21047.

17766. **Crushed stone**, carloads (See Note 2), from Lime Crest, N. J.

To N. J. points	Prop. Rate	To N. J. points	Prop. Rate
Newark	$1.50	Freehold	$1.65
Elizabeth	1.50	Keyport	1.65
Westfield	1.50	Red Bank	1.65
Somerville	1.50	Eatontown	1.65
White House	1.40	Lakewood	1.75
Annandale	1.40	Toms River	1.85
Bloomsbury	1.35		

Rates in cents per ton of 2000 lb.
Reason—Proposed rates are comparable with rates now in force from and to points in the same general territory as per C. R. R. of N. J. I. C. C. G3295.

17785. (A) **Sand** (other than blast, engine, filter, fire, foundry, glass, molding, quartz, silex or silica) **and gravel** (other than molding gravel), carloads, (B) **sand (blast, engine, filter, fire, foundry, glass, molding, quartz, silex or silica) and molding gravel**, carloads (See Note 2), from Cape May, N. J., to Chestertown, Md., (A) $2.40 and (B) $2.60 per ton of 2000 lb. Reason—Proposed rates are the same as now in effect from Cape May, N. J., to Perryville, Stemmers Run, Baltimore, Md., as per Reading Co. I. C. C. 182.

17791. **Sand**, other than blast, engine, glass, molding, foundry, silex or quartz, **and gravel**, carloads (See Note 2), from Springfield, N. Y., to Friendship, Bolivar, Sanford, Ceres, Prosser, Weston and Portville, N. Y., $1.25 per ton of 2000 lb. Reason—Proposed rate is comparable with rates from Attica and Buffalo, N. Y., to Moraine and Angelica, N. Y., as per Erie R. R. I. C. C. No. 17952.

17795. **Crushed stone**, carloads (See Note 2), from Morrisville, Penn., to Deal Beach, Allenhurst, North Asbury Park, Asbury Park, Ocean Grove and Bradley Beach, N. J., 90c per ton of 2000 lb. Reason—Proposed rate is comparable with rates from Tullytown, Penn., to Toms River, Sea Girt, Manasquan, N. J., and from Morrisville, Penn., to River Bank, N. J., as per P. R. R. G. O. I. C. C. Nos. 13940 and 14500.

17799. **Ground or unburnt pulverized limestone**, carloads, minimum weight 50,000 lb., from Alco, Carmine and Pontmours, Va., to Buffalo, N. Y., and points taking same rates, 19½c per 100 lb. Reason—Proposed rate is comparable with rates now in force from Strasburg, Va., Frederick, Baltimore, Md., etc.

17848. **Sand, molding**, carloads (See Note 2), from Irvine Mills, Carrollton and Olean, N. Y., to Detroit, Mich., $2.40 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

17853. **Limestone, ground, precipitated or pulverized**, and limestone dust, carloads, minimum weight 50,000 lb., from Atlas, Hamburg and Lime Crest, N. J., to Hagerstown, Md., 9c per 100 lb. Reason—Proposed rates are comparable with rates from Cavetown and Security, Md., to Hamburg, N. J., as per W. Md. I. C. C. 7770.

17859. **Sand and gravel**, carloads (See Note 2), from Springtown, N. J., to Flemington Junction, N. J., $1 per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in force from Springtown, N. J., to Pittstown and Clinton, N. J., as per C. N. J. I. C. C. G2038.

17864. (A) **Sand**, other than blast, engine foundry, glass, molding or silica, and gravel, carloads; (B) **sand, blast, engine, foundry, glass, moulding or silica**, carloads (See Note 2), from Irvine Mills, N. Y., to stations in Pennsylvania, New York and Maryland; Reading, Johnstown, Pittsburgh, Williamsport, Warren, Corry, Bradford, Oil City, Penn.; White House, Olean, Buffalo, Rochester, Machias, Salamanca, Dunkirk, Lackawanna, N. Y.; Baltimore, Sparrows Point, Woodbury, Md., and various (A) rates ranging from 75c to $2.70, (B) rates ranging from 75c to $3 per ton of 2000 lb. Reason—To place the shippers at Irvine Mills, N. Y., on a comparable basis with shippers located at Allegheny and Olean, N. Y.

17877. **Sand, blast, engine, core, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica**, carloads (See Note 2), from Cheswick, Penn., to Midland, Penn., $1.26 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Coverts, Pittsburgh, Penn., as per P. R. R. G. O. I. C. C. F2104.

17791 (corrected). **Sand**, other than blast, engine, glass, molding, foundry, silex or quartz, and **gravel**, carloads, minimum weight 90% of marked capacity of car, from Springville, N. Y., to Friendship, Bolivar, Sanford, Ceres, Prosser, Weston and Portville, N. Y., $1.25 per ton of 2000 lb. Reason—The above proposal redocketed to correct point of origin which was shown as Springfield, N. Y., in the original proposal.

SOUTHERN FREIGHT ASSOCIATION DOCKET

36487. **Limestone, ground or pulverized**, from Ashford, N. C., to Southern Ry. stations between Biltmore, N. C., and Rockliff, N. C. Class rates

now apply. Proposed rates on ground or pulverized limestone, carloads, minimum weight 30 net tons, from Ashford (formerly Linville Falls), N. C.: To Buena Vista, N. C., 126c; Busbee to Flat Rock, N. C., inclusive, 135c; Tuxedo to Rockliff, N. C., inclusive, 144c per net ton, based on the joint line scale contained in Southern Ry. I. C. C. A10132.

38508. **Sand and gravel**, also lime, between Cincinnati, Ohio, on the one hand, and Covington-Newport, Ky., and points taking rates, on the other hand; and between Covington and Newport, Ky. It is proposed to revise the local rates between the foregoing mentioned points to be as follows: Sand and gravel, straight or mixed, carloads (See Note 3), 50c per net ton. Lime, common, hydrated, quick or slack, in bulk or in packages, carloads, minimum weight 30,000 lb., 70c per net ton. The proposed revision represents advances. The sand and gravel rate is made on basis of I. C. C. Docket 17517 scale, while the lime rate is made on scale used in the recent pass in determining revised rates between southern points. It is also proposed to apply the same rates between Covington, Ky., and Newport, Ky.

38524. **Sand and gravel**, from Ellerslie and Warmore, Va., to Elizabeth City, N. C. **Present rate**, 170c per net ton. Proposed rate on sand and gravel, carloads, as described in A. C. L. R. R. I. C. C. B2477, from and to points named, 158c per net ton—same as rate in effect from Richmond, Va.

38526. **Sand, gravel, crushed stone**, etc., from Johnsonville, Tenn., to Fulton, Ky. **Combination** rate of 152c per net ton now applies. Proposed rate on sand, gravel, crushed stone, slag, rubble-stone, broken stone and chert, in straight or mixed carloads (See Note 3), from Johnsonville, Tenn., to Fulton, Ky., 105c per net ton, based on the joint line mileage scale, as per I. C. C. Docket 17517.

SOUTHWESTERN FREIGHT BUREAU DOCKET

14235. **Sand and gravel**, from Black Rock, Ark., to points in Tennessee, Mississippi, etc. To establish the following rates in cents per 100 lb. on sand and gravel, carloads (See Note 3), from Black Rock, Ark., to points shown below:

To (St.L.-S. F. Ry.)	Rate	To (St.L.-S. F. Ry.)	Rate
James Mill, Ark.	102	Mahon, Miss.	120
Harvard, Ark.	102	Holly Spgs., Miss.	120
Marion, Ark.	102	Waites, Miss.	132
Pallfelt, Ark.	102	Potts Camp, Miss.	132
Bridge Jct., Ark.	102	Winborn, Miss.	132
Memphis, Tenn.	102	Hickory Flat, Miss.	132
Forsythe, Tenn.	120	Myrtle, Miss.	132
Capleville, Tenn.	120	Glenfield, Miss.	132
Min. Wells, Miss.	120	New Albany, Miss.	132
Olive Branch, Miss.	120	Wallerville, Miss.	132
Miller, Miss.	120	Blue Springs, Miss.	132
Byhalia, Miss.	120	Sherman, Miss.	132
Victoria, Miss.	120	Belden, Miss.	132
Red Banks, Miss.	120	Tupelo, Miss.	132

Shippers request that same rates be established on sand and gravel as are currently applicable on crushed stone.

14237. **Crushed stone**, from Stringtown, Okla., to Texas points. To establish the following distance scale of rates on crushed stone and gravel, carloads (See Note 3), from Stringtown, Okla., to points in Texas:

Distances (miles)	Rates: Single Line	Rates: Joint Line (Note)
60 miles and over 50	80	100
65 miles and over 60	84	100
70 miles and over 65	84	100
75 miles and over 70	90	105
80 miles and over 75	90	110
90 miles and over 80	95	110
100 miles and over 90	100	115
110 miles and over 100	105	120
120 miles and over 110	110	125
130 miles and over 120	115	130
140 miles and over 130	120	135
150 miles and over 140	125	140
175 miles and over 150	133	148
200 miles and over 175	141	156
225 miles and over 200	149	164
250 miles and over 225	157	172

Note—For two-line application.

Rates on the commodities involved were established from Stringtown to points in Texas on the M.-K.-T. of T. and L. R. & N. of T., effective December 7, 1927. It was thought the rates established thereunder would enable shippers at Stringtown to move shipments into Texas, but it has developed after thorough trial that with the competition encountered elsewhere and the mileage scale of rates established in Texas, effective June 1, 1927, the present rates will not move the traffic.

14243. **Gravel**, from points in Oklahoma to points in Missouri and Kansas. To establish the following rates in cents per 100 lb. on gravel, carloads (See Note 3), from and to points shown below:

To	From Ft. Gibson, Okla. Rate	From Muscogee, Okla. Rate
Joplin, Mo.	8	8
Webb City, Mo.	8	8
Springfield, Mo.	8	8
Pittsburg, Kan.	8½	8½
Seligman, Mo.	7½	7½
Washburn, Mo.	7½	7½
Wayne, Mo.	7½	7½
Exeter, Mo.	7½	7½
Butterfield, Mo.	7½	7½
Purdy, Mo.	7½	7½
Wightman, Mo.	7½	7½
Monett, Mo.	7½	7½

To	From Keough, Okla. Rate	From Byllesby, Okla. Rate
Joplin, Mo.	8	8
Webb City, Mo.	8	8
Springfield, Mo.	8	8
Pittsburg, Kan.	8½	8½
Seligman, Mo.	7½	7½
Washburn, Mo.	7½	7½
Wayne, Mo.	7½	7½
Exeter, Mo.	7½	7½
Butterfield, Mo.	7½	7½
Purdy, Mo.	7½	7½
Wightman, Mo.	7½	7½
Monett, Mo.	7½	7½

Shippers are complaining account of lower rates in effect on sand from Byllesby and Ft. Gibson, Okla., to Seligman, Joplin, Springfield, Mo., and Pittsburg, Kan., and have requested a readjustment of rates.

14268. **Sand**, from Guion, Ark., to Guthrie, Okla. To establish a rate of 13½c per 100 lb. on sand, carloads (See Note 2), from Guion, Ark., to Guthrie, Okla. Shippers have requested that the present rate of 13½c per 100 lb. to Tulsa, Okla., also be made applicable to Guthrie, Okla.

14292. **Limestone**, from Texas points to Oklahoma points. To establish the following distance scale of rates on **agricultural limestone**, in bulk in bags, carload, minimum weight 40,000 lb., for application from Austin, Dittlinger, McNeil and Round Rock, Texas, to points in Oklahoma:

Distance (miles)	Rates: Single	Rates: Two Lines	Rates: Three Lines
40 and under	3½	4½	5½
60 and over 40	4	5	6
80 and over 60	5	6	7
110 and over 80	5½	6½	7½
130 and over 110	6½	7½	8½
170 and over 130	7	8	9
220 and over 170	8	9	10
250 and over 220	8½	9½	10½
260 and over 250	9	10	11
300 and over 260	10	11	12
340 and over 300	10½	11½	12½
400 and over 340	11½	12½	13½
450 and over 400	12½	13½	14½
500 and over 450	13½	14½	15½
550 and over 500	14½	15½	16½
600 and over 550	15½	16½	17½
650 and over 600	16½	17½	18½

The above distance scale is desired in order to permit the interests at the producing points named to reach the same destination territory in Oklahoma as the producers located Harrys, Eagle Ford and Ft. Worth, Texas.

14307. **Crushed stone**, from Stringtown, Okla., to Ft. Smith, Ark. To establish a rate of 7c per 100 lb. on crushed stone (See Note 1), except when cars are loaded to actual visible loading capacity, when actual weight shall govern, but not less than 50,000 lb., from Stringtown, Okla., to Ft. Smith, Ark. Shippers state that the present Class E rate on this traffic is prohibitive.

TRANSCONTINENTAL FREIGHT BUREAU DOCKET

7589 (reopened). **Ground limestone**, carloads, W. B.: Request for rate of 56½c per 100 lb. on ground limestone, carloads, minimum weight 50,000 lb., from Group "D" to Pacific Coast points under Tariffs 1C (I. C. C. Nos. 76, A195, 1964 and 1192 of Frank Van Ummersen, H. Wilson, B. T. Jones and H. G. Toll, Agents, respectively) and 47 (I. C. C. Nos. 77, A196, 1971 and 1194 of Frank Van Ummersen, H. Wilson, B. T. Jones and H. G. Toll, Agents, respectively).

WESTERN TRUNK LINE DOCKET

1814A. **Granite, crushed, slag, crushed, stone, crushed.** (See Note 3.) In no case shall the minimum weight be less than 40,000 lb. From Red Granite, Wis., to Powerton, Havana and Petersburg, Ill. Present rate, 14½c per 100 lb. (group rate to Peoria); proposed, 11c per 100 lb.

1993A. **Limestone, agricultural**, carloads (See Note 2), from Meadow, Neb., to C. R. I. & P. stations in Iowa. Rates in cents per ton of 2000 lb. for a few representative distances are as follows:

Miles	Pres.	Prop.	Miles	Pres.	Prop.
50	70	63	200	170	135
100	120	83	250	190	150
145	140	113			

2310E. **Sand, gravel, sand pit strippings, gravel pit stripping**, carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb. From Portage, Wis., to Davenport, Iowa. **Present** rate, $1.50 per net ton; proposed, $1.30 per net ton.

1376V. **Sand, silica, pumice and volcanic ash**, carloads, from Arkalon, Kan., to Cairo, Thebes, Brookport, Metropolis, Mound City and other Illinois points, covered by Docket 1376S and Rate Advice 8493. Present, Class E rate, 52c; proposed, 29c per 100 lb.

4742F. **Sand and gravel** (except glass, silica or molding), carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., between points in Wisconsin and Iowa; also between Illinois and Iowa (except points on Mississippi River, Dubuque to Muscatine, Iowa), via C. M. & St. P. Present and proposed rates for a few representative distances are as follows:

	Pres.	Prop.		Pres.	Prop.
5 miles	70	75	250 miles	280	190
50 miles	130	90	300 miles	310	210
100 miles	180	130	350 miles	320	230
150 miles	220	150	400 miles	340	240
200 miles	240	170			

Rates in cents per ton of 2000 lb.

4742E. **Limestone dust**, carloads, from Centerville, Iowa, to St. Joseph and Kansas City, Mo. Present rates—To St. Joseph 11½c, Kansas City 12c per 100 lb., Iowa-Missouri local distance rates; proposed, to St. Joseph $1.60 per ton of 2000 lb., to Kansas City $1.70 per ton of 2000 lb. Present minimum weight, 40,000 lb.; proposed, 80,000 lb.

1376-W—Rates. **Sand, silica, pumice, ash, volcanic**, minimum weight marked capacity of car, but not less than 60,000 lb., except when car of less than 60,000 lb. capacity is furnished at carrier's convenience, marked capacity of car will apply. From Wilmore, Kan. To Wichita, Kan. Present, 15½c; proposed, 9c.

Sup. 1 to 6366—Rate. **Stone, crushed**, carloads. Usual minimum weight. From East St. Louis, Ill. To Council Bluffs, Iowa, and Omaha, Neb. Present, 13½c per 100 lb.; proposed, 11c per 100 lb.

2079-E. **Stone, crushed**, carloads (See Note 3). In no case shall the minimum weight be less than 40,000 lb., from Ablemans, Berlin, Liberty Bluff, Lohrville, Mayville, Montello, Nishkoro, Spring Lake, Red Granite, Stevens Point, Utley and Waupaca, Wis., to Bettendorf and Dubuque, Iowa. Present, 11c; proposed, to Bettendorf, 10c; Dubuque, 9½c.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

13919. **Limestone, agricultural**, carloads, minimum weight 50,000 lb., from West Stockbridge, Mass., to Lake, Sugar Loaf and East Chester, N. Y., 10½c, via Maybrook, N. Y., L. & H. R. Ry. Reason—To provide same rate as is now in effect from West Stockbridge, Mass., to contiguous points.

13925. **Stone, broken or crushed**, in bulk, in gondola or other open top cars, carloads (See Note 3), from Meriden, Conn., and Meriden (York Hill Quarry), Conn., to Mansfield, Conn., $1.40 per net ton. Reason—To meet competition.

13978. **Gravel**, carloads (See Note 3), from East Weare, N. H., to Black Rock, Buffalo, East Buffalo, Echota, Harriet, LaSalle, Niagara Falls, North Tonawanda and Suspension Bridge, N. Y., 19c, via Rotterdam Junction, N. Y., and the N. Y. C. R. R. or West Shore R. R. Reason—To place shippers at East Weare, N. H., on a parity with shippers located in contiguous territory.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4351. **Sand and gravel**, carloads (See Note 1), from Bacon, Ill., to Rutland, Toluca & Northern R. R. stations, viz. (rates in cents per net ton):

To	Pres.	Prop.
Porterfield, Ill.	88	76
Big Sandy, Ill.	101	76
Henry Junction, Ill.	101	76
Magnolia, Ill.	101	76
Price Valley, Ill.	101	76
McNabb, Ill.	101	76
Granville, Ill.	101	76

1257E. **Sand**, carloads (See Note 1), from Chicago, Ill., and points taking same rates as shown on pages 37 to 61, inclusive, of Jones' 108L, to Natchez, Miss.

CENTRAL FREIGHT ASSOCIATION DOCKET

17684. To establish on **sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica**, carloads, Cheswick, Penn., to Midland, Penn., rate of $1.26 per net ton. Present rate, $1.62 per net ton.

17648. To establish on **sand, foundry, glass, grinding or polishing, loam, molding, or silica**, carloads, Meadville, Penn., to Findlay, Ohio, rate of $2.02 per net ton. Present rate, sixth class rate of 21c.

17651. To establish on **sand** (except blast, core, engine, filter or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads, Wolcottville, Ind., to Alpine, Ill., rate of 95c per net ton. Route, via Wabash Ry. direct. Present rate, 17c (sixth class).

17652. To establish on **gravel and sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads, Steubenville, Ohio, to Weirton, W. Va., rate of 60c, and to Burgettstown, Penn., rate of 80c per net ton. Present rate, 70c per net ton to Weirton, W. Va., and 90c per net ton to Burgettstown, Penn.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@1.00	1.35@1.50	1.15@1.50	1.10@1.15	1.05@1.10	1.05@1.10
Ft. Spring, W. Va.	.50	1.40	1.40	1.35	1.20	.....
Munns, N. Y.	1.00	1.50	1.50	1.50	1.25	.....
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.80	1.45	1.15	.95	.95	1.10
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.50	.50	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	.90@1.25	.80@1.35	1.00@1.35	.90@1.35	.90@1.35	.....
Cypress, Ill.	1.25	1.15	1.10	1.00	1.00	1.00
Dubuque, Iowa (h)	.80	1.40	1.40	1.40	1.35	1.35
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa (f)	1.10	1.55	1.55	1.55	.....	.....
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.....	.....	1.20	1.10	1.00	.....
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Cartersville, Ga.	1.65	1.65	1.65	1.35	1.15	1.15
Chico and Bridgeport, Tex.	1.00	1.30	1.25	1.20	1.15	1.10
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co.,,Mo. (p)	1.25	1.25	1.00	1.00	1.00	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.00	1.75	1.55	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	.....
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.40@1.80	2.30	1.40@2.30	1.40@1.70	1.70	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.50@ .75	1.25@1.50	1.25@1.50	1.10@1.25	1.10@1.25	.....
Springfield, N. J.	2.00	2.10	2.10	1.60	1.60	.....
Toronto, Canad (m)	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.	.50	1.75@1.90	1.75@1.90	1.75@1.90	1.60@1.75	.....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	.....	2.35	.....	.....	.....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.	.....	.....	1.30	1.25	1.20	1.20

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.40. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .80. (p) Carload prices.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh	4.50
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 50% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 4 mesh	1.50
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; all sizes	1.25
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk	2.70
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk, 1.75; bags	3.75
Marl—Analysis, 90% $CaCO_3$; 10% $MgCO_3$; bulk, 2:25; bags	4.00
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis 99.05% $CaCO_3$; 90% thru 50 mesh	6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50

Agricultural Limestone

(Crushed)

Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5%; $MgCO_3$; 90% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — 50% thru 100 mesh	1.50
Danbury, Conn.; Adams, Ashley Falls and West Stockbridge, Mass.—Analysis 90% $CaCO_3$, 5% $MaCO_3$; 50% thru 100 mesh, bulk	3.50
100-lb. paper bags	4.75
100-lb. cloth bags	5.25
(All prices less 2%, 15 days.)	
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.50
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Linwood, Iowa — Analysis, 96-86.5% $CaCO_3$, 1.39% or less $MgCO_3$; 100% thru 4 mesh	1.00
40% thru 50 mesh	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh, bags	5.00
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.35
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	.90@1.50

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$; 95% thru 100 mesh; paper bags	3.50
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Buffalo, N. Y.	2.00@ 2.50
Cedarville and S. Vineland, N. J.	*1.75@ 2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Gray Summit and Klondike, Mo.	1.75@ 2.00
Klondike, Mo.	2.00
Los Angeles, Calif.—Washed	5.00
Massillon, Ohio	3.00
Michigan City, Ind.	.35
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Pittsburgh, Penn.	3.00@ 4.00
Red Wing, Minn.	1.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.00
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Utica and Ottawa, Ill.	.75@ 1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Chippewa Falls, Wis.		.25*

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.	.65	.55	1.00	1.35	1.40	
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.	.60				1.40	
Machias Jct., N. Y.	.85	.65	.65		.65	.65
Montoursville, Penn.	1.00	.85	.75	.75	.75	.75
Northern New Jersey	.50@ .90	.50@ .90		1.25	1.25	1.25
Portland, Me.	1.00	1.00	2.50		2.25	
Somerset, Penn.		2.00				
Washington, D. C.	.60@ .85	.60@ .85	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.25@ .80	.50@ .70	.10@ .40	.50@ .70	.60@ .80	.60@ .80
Barton, Wis.		.55	.75	.75	.75	.75
Columbus, Ohio		.85	.85	.85	.85	
Des Moines, Iowa		.30	1.30	1.30	1.30	1.30
Eau Claire, Chippewa Falls, Wis.		.50	.70		.95	
Elkhart Lake, Wis.	.60	.50	.40	.56	.50	.50
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio	1.00	1.00	1.00		1.00	
Hersey, Mich.		.50		.70		.70
Humboldt, Iowa	.35@ .50	.35@ .50	1.35@1.50	1.35@1.50	1.35@1.50	1.35@1.50
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Mankato, Minn.		.45		1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.85	.85	.85	.85	.85	.85
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.15	1.10
SOUTHERN:						
Brewster, Fla.	.45	.45	3.00			
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.50				
Ft. Worth, Texas						.85
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
New Martinsville, W. Va.	1.00	.90@1.00		1.30@1.40		.80@ .90
Roseland, La.	.25	.15	1.25	.85	.45@ .65	
WESTERN:						
Kansas City, Mo.	.70	.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Phoenix, Ariz.	1.25	1.00	1.50	1.25	1.10	1.00
Pueblo, Colo.	.80	.60		1.20		1.15
San Diego, Calif.		.40@ .50	.80@1.00	.80@1.00	.65@ .80	.65@ .80
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Des Moines, Iowa	.50					
Dresdon, Ohio	.60@ .75	.70	.60	.80	.75	.65
East Hartford, Conn.	.85*d					
Eau Claire, Chippewa Fls., Wis					.65	
Ft. Worth, Texas						.85
Gainesville, Texas						.55
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.50	.50				
Mankato, Minn.	.30					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramec River.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	2.75	2.75	2.75	1.00@2.75		1.75@4.50	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75@2.00	1.75@2.00		1.75	1.75@2.00		
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Cedarville and S. Vineland, N. J.				2.25			
Columbus, Ohio	1.50@2.00	1.25@1.50	2.00	.30	1.75@2.00	2.75@4.50	
Dresden, Ohio	1.50@1.75	1.25@1.50	1.50@1.75	1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10@1.50	1.25@2.00	2.00			2.75@3.00	
Klondike, Mo.				2.00	2.00		2.00
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30@ .35			
Millville, N. J.				1.75b		3.50	
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	2.25	1.25					
Ohlton, Ohio	1.75b	1.75b		2.00b	1.75b	1.75b	
Ottawa, Ill.						3.50	
Red Wing, Minn.(d)					1.50	3.00	1.50
Round Top, Md.				1.60		2.25	
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.			Pottery sand, 8.00@12.00				
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	1.50*2.00	1.50*@2.00	1.75	1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried. 2.50. (b) Damp. (c) Shipped from Albany. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Chazy, N. Y.		8.50	7.50	10.00		15.50[1]	8.50	14.00
Lime Ridge, Penn.					5.00[2]			
Pittsburgh, Penn.	11.50	8.50	8.50		9.00	11.00	8.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.			10.00				6.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[3]
CENTRAL:								
Afton, Mich.							7.80	1.35
Carey, Ohio	11.50	7.50	7.50		9.00		8.00	1.50
Cold Springs, Ohio		8.50	8.50				8.00	
Cold Springs and Gibsonburg, Ohio	11.50	8.50	8.50		9.00	11.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio[5]	11.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Scioto and Marble Cliff, O.		8.50	8.50	9.50	8.25	.62½	7.50	1.50[3]
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	8.50	8.50	12.50	8.00	10.00[9]	9.00	1.50[3]
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas							7.00	1.50
Frederick, Md.		9.00	9.00	9.50	7.50	9.00	7.50	9.00
Graystone, Ala.	12.50	10.00		12.50		1.40[14]	8.50	1.50
Keystone, Ala.		10.00	8.00	10.00	8.00		8.00	1.50
Knoxville, Tenn.	20.25	8.50	8.50	8.50			7.50	1.25
Ocala, Fla.	14.00	12.00	11.50	12.00			11.50	1.60
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Cartland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	16.00		16.00	16.00			16.00	
San Francisco, Calif.	20.00	20.00	13.50	21.00			14.50[20]	2.15
Tehachapi, Calif.[13]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [14] Per 2 bags of 90 lb. each. [22] To 9.00. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Columbus, Ohio		.15@ .30
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.10
Ohlton, Ohio	*1.75@ 2.00	*1.75
Red Wing, Minn.		1.00
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50	3.50
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel crayons, gross	1.00@ 2.80
Chatsworth, Ga.:	
Crude talc, grinding	5.00
Ground talc (20-50 mesh), bags	9.00
Ground talc (150-200 mesh)	10.00
Pencils and steel crayons, per gross	1.50@ 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	9.00@10.00
Same, burlap bags, bags extra	8.00@ 9.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5 00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Glendon, N. C.:	
Ground talc (150-200 mesh), bulk	6.00@10.00
Ground talc (150-200 mesh), bags	8.00@14.00
Pencils and steel crayons, gross	1.05@ 2.00
Blanks, .08 per lb.; cubes	50.00
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.50
Ground talc (150-200 mesh), bags	8.00@14.50
Joliet, Ill.:	
Ground talc (200 mesh, grey), bags	10.00
Ground talc (200 mesh, white), bags	20.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock	
Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-68%	3.75@ 4.25
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00
Ground Rock (2000 lb.)	
Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72.5%	9.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50@24.00
Roofing mica	37.50
Punch mica, per lb.	.12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.— Pink marble chips	§3.00	§3.00
Crown Point, N. Y.— Mica spar		9.00@10.00
Easton, Penn.— Green stucco		12.00@18.00
Green granite		14.00@20.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash		8.00@16.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		5.50@ 7.50
Phillipsburg, N. J.— Royal green granite		15.00@18.00
Roadville, Mich.— Crystalite crushed white marble, bulk	4.00	4.00@ 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Natrock" roofing grits		12.00@18.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	
Wauwatosa, Wis.		10.00@15.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 16.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 40 mesh to 200 mesh	15.00@28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; crude, bags, 10.00@12.00; bulk	9.00@11.50
Pulverized, 95% thru 200 mesh; bags, 19.73@22.00; bulk	15.83@20.00
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk	18.00
Crude	9.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich. (Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass. (Limestone)	‡7.50@*9.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton including sacks	12.00
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Warren, N. H.—(Mica), per ton	3.85@ 3.90
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@16.00*
Farmington, Conn.	13.00
Flint, Mich.	¶12.00@17.50*
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@19.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	16.00*
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50b
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada	13.50@16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	14.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M, 10 days. (b) Red, $16.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.		2.35
Baltimore, Md.		2.15@2.25
Birmingham, Ala.		2.10
Boston, Mass.		2.13@2.23
Buffalo, N. Y.		2.00@2.10
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa		2.24
Charleston, S. C.		2.35
Cheyenne, Wyo.	.82¾	3.31
Chicago, Ill.	.51¼	2.05
Cincinnati, Ohio		2.22
Cleveland, Ohio		2.24
Columbus, Ohio		2.22
Dallas, Texas		2.00
Davenport, Iowa		2.24
Dayton, Ohio		2.24
Denver, Colo.	.66¼	2.65
Des Moines, Iowa		2.05
Detroit, Mich.		1.90
Duluth, Minn.		2.04
Houston, Texas		2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.		2.10
Jacksonville, Fla.		2.20
Jersey City, N. J.		2.03@2.13
Kansas City, Mo.		1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.		2.10
Milwaukee, Wis.		2.20
Minneapolis, Minn.		2.12@2.22
Montreal, Que.		1.36
New Orleans, La.		2.07
New York, N. Y.		1.93@2.03
Norfolk, Va.		2.07
Oklahoma City, Okla.		2.46
Omaha, Neb.		2.36
Peoria, Ill.		2.22
Philadelphia, Penn.		2.11@2.21
Phoenix, Ariz.		3.26
Pittsburgh, Penn.		2.04
Portland, Colo.		2.80
Portland, Ore.		2.60@2.70‡
Reno, Nev.		2.91
Richmond, Va.		2.24@2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.21
Savannah, Ga.		2.50
St. Louis, Mo.		1.95
St. Paul, Minn.		2.12@2.22
Seattle, Wash.		2.50†@2.65
Tampa, Fla.		2.25
Toledo, Ohio		2.20
Topeka, Kan.		2.41
Tulsa, Okla.		2.33
Wheeling, W. Va.		2.12
Winston-Salem, N. C.		2.44

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Buffington, Ind.		1.80
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.35
Davenport, Calif.		2.45*
Hannibal, Mo.		1.90
Hudson, N. Y.		1.75
Leeds, Ala.		1.65
Lime and Oswego, Ore.		2.70‡
Mildred, Kan.		2.35
Nazareth, Penn.		2.15
Northampton, Penn.		1.75
Richard City, Tenn.		2.05
Steelton, Minn.		1.85
Toledo, Ohio		2.20
Universal, Penn.		1.80

NOTE—Add 40c per bbl. for bags.
*Includes sacks.
†10c discount, 10 days. ‡10c discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	¾x32x 36". Per M Sq. Ft.	Wallboard, ¾x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u					11.70u			
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50			13.50			
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.					14.30o	12.30m		m9.00@11.00o					
Delawanna, N. J.						12.50		8.25			14.00	15.00	33.61
Douglas, Ariz.			6.00	14.50	15.00		18.00		30.00				
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50		24.55	20.00			
Gypsum, Ohio	3.00	4.00	6.00	7.00	9.00	9.00	18.00	7.00	27.50	19.00			
Los Angeles, Calif.			7.50@9.50	11.50y									
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00		20.00	30.00
Portland, Colo.				10.00									
San Francisco, Calif.			9.00	13.40	14.40		15.40						
Seattle, Wash.	6.60	10.00	10.00	13.00									
Sigurd, Utah									21.50				
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00					20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	16.00	.....	.....
Detroit, Mich. (d)	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00*	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind	.10@ .12a	.....	.....
Los Angeles, Calif.	4x8x12—5.00*	4x6x12—4.20*	
Oak Park, Ill.	20.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35

†Price per square.

Houston, Texas—Roofing Tile, per sq.	25.00

Indianapolis, Ind.—9x15-in.

	Per sq.
Gray	10.00
Red	11.00
Green	13.00

Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

	Per 100
Cement City, Mich.: 5x8x12	5.00
Columbus, Ohio: 5x8x12	6.50
Grand Rapids, Mich.: 5x8x12	8.00
Longview, Wash.: 4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.: 5x8x12	78.00
Houston, Texas: 5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Columbus, Ohio	16.00	17.00
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	25.00@30.00
Mt. Pleasant, N. Y.	.....	14.00@23.00
Oak Park, Ill.	.....	42.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.00@ 25.00
Rapid City, S. D.	17.00	25.00@ 35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in
Detroit, Mich.	15.00 per ton																
Grand Rapids, Mich.	4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off																
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.	Sewer pipe 40% off list; culvert—list																
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., $18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.	12.00 per ton																
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.70	.....	2.00	.....	2.75	3.40	.....	6.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Yakima, Wash.							1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

(a) 24-in. lengths; (b) Reinforced.
†21-in. diam. ‡Price per 2-ft. length.

Third Government Test Strikes Substantial Bodies of Potash

THE THICKEST bodies of potash salts yet revealed by government tests have been found in the third government well drilled in Eddy county, New Mexico, according to a statement made public by the Interior Department. The Geological Survey has recently completed analyses of samples selected from the core of this well which show that within 1500 ft. of the surface nine beds or groups of beds of possible commercial interest were encountered. One of these, at a depth of about 1466 ft., is 8 ft. 10 in. thick and contains 11.08% of potash (K_2O) in the sample as received, equivalent to 18.25% K_2O in the soluble salts. Other noteworthy beds range in thickness down to 2 ft. 3 in. and in potash content from 8.50 to 13.68% in the samples as received. Only one potash mineral, polyhalite ($K_2SO_4 \cdot MgSO_4 \cdot 2CaSO_4 \cdot 2H_2O$), was recognized in the samples recovered in drilling, but owing to difficulties experienced in this connection some of the more soluble salts originally present may have been lost. The polyhalite occurred in a number of colors and textures, including a coarsely crystalline variety which is apparently new in this country.

St. Louis Quarrymen Meet

AT the annual meeting of the St. Louis Quarrymen's Association, held in St. Louis on February 15, Wm. Eyerman was elected president to succeed Louis Skrainka, the retiring president. The other officers elected were Theodore Fehlig, vice-president, and J. W. McCullough of the Rock Hill Quarry Co., secretary and treasurer. Col. E. J. McMahon continues as the executive secretary. The report for the year 1927 showed that two advertising campaigns were carried on. One campaign was to increase the use of limestone as an aggregate and the other covered the use of rubble and building stone, and it was reported that both campaigns resulted in considerable tonnage gains. The association during 1927 was also successful in securing a reduction of approximately 25% in the rate of the state liability insurance. This association is a very small group but it has always shown an unusual amount of activity.

Cement Products

TRADE MARK REGISTERED WITH U. S PATENT OFFICE

Well-Planned Cement Products Plant

Wm. H. Devos Co., Milwaukee, Wis., Operation Designed on Straight-Line Gravity System

THE plant and equipment of the cement products plant of the Wm. H. Devos Co. in Milwaukee, Wis., furnishes a good example of a well-planned and efficient layout for a good-sized block plant. The plant in its present state is the result of a long and varied experience with a number of different plans which finally terminated in the present layout. Wm. H. Devos, the founder of the company, has always been a leader in bringing new ideas into the products field, and this plant plainly shows the results.

The Devos plant has been carefully designed on the "straight-line," gravity plan. That is, the raw materials start from bins at the top of the plant and pass straight through the various operations without once crossing back over the straight-line flow, and without the need of any elevators after leaving the bins. This plant has a normal capacity of 750,000 blocks annually, and the production will average about 600,000 to 650,000 blocks. The plant is equipped with two mixers and three block machines.

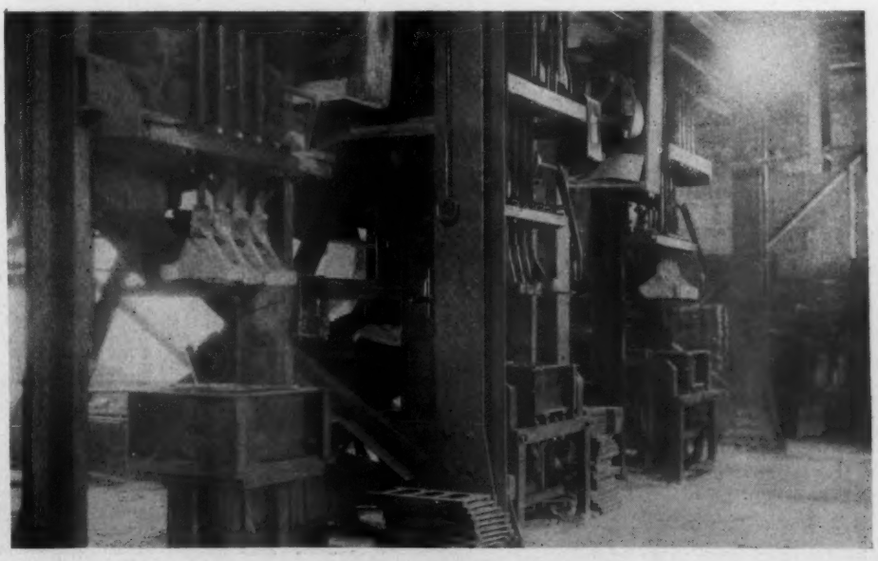
Handling the Material

The plant is conveniently situated beside the C. M. & St. P. R. R., and a siding is owned by the company, from which the material is unloaded into a bin between the track and plant building. The railroad at present is contemplating the elevation of all the tracks at this point, which will make possible a track hopper or other form of convenient bin below the track level. At present an elevating loader made by the Northern Conveyor Co. of Janesville, Wis., is used to carry the sand from the outside bin to the foot of a bucket elevator inside of the plant. This loader is hung from a craneway above the bins. The inside elevator takes either the sand or stone to the bins at the very top of the building, and discharges at a height of 55 ft. above the ground. It was made by the Chain Belt Co. of Milwaukee and is operated by a 5-hp. General Electric motor. A bag elevator, also made by the Chain Belt Co., is beside the large elevator and is used to carry bags of cement to the storage space near the mixers on the second floor. This is operated by the same motor that operates the taller elevator.

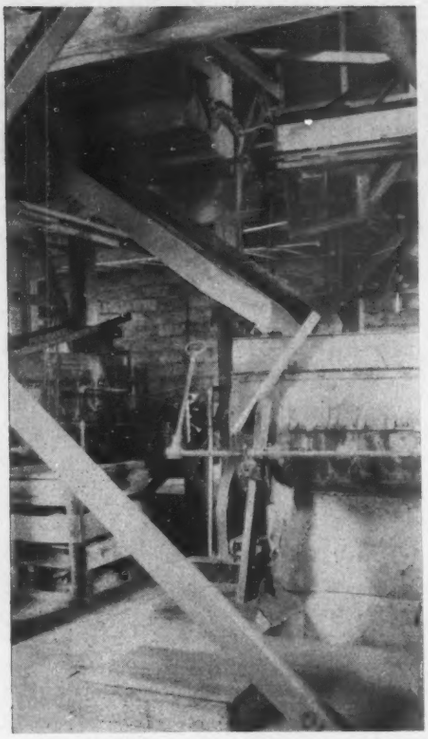
The bin at the top of the building, which holds 110 yd. of material, is divided into two equal-sized bins for the sand and the stone. The bins were installed by the Butler Bin Co. of Waukesha, Wis., and are of all-steel construction with heavy steel columns for support, passing right through the two lower floors of the plant. The material flows, as directed, to the center of either bin from the head of the bucket elevator, down a chute of approximately 45 deg., and no shoveling is required in the bin. An interesting feature of the bins is the live steam pipe passing horizontally through the bottom of each to thaw the material and keep it running out as needed. Also each bin is fitted with an adjustable, automatic batching box so that an accurate mix of the materials is always assured.

Mixers and Block Machines

Two 14-ft. Blystone mixers are located on the second floor of the plant, in such a position that the discharge from the batch boxes above falls just between them. This discharge is diverted to one or the other mixers by a steel chute balanced in the middle, which can be set to furnish the material to either mixer. The mixing is watched here by one man, who also adds the cement from the storage piles near by. He gives the mix about one minute of dry mixing and four to six minutes of wet mixing. The room in which the mixers are located is remarkably large, light and airy, covering the whole second floor of the plant, except for a small space taken up in the far corner by the company's offices. As noted above, it is used chiefly for the storage of cement, except, of course, the space taken by the mixers and other equipment. At one end of the room is a large doorway with a projecting I-beam for the unloading equipment from trucks to this room. There is also a Wirth bag cleaner



Three automatic strippers on the main floor of the plant. The steel columns are the supports for the material bins



Mixer and chute from batch boxes above

beside the mixers, operated by a 5-hp. General Electric motor. The mixers are driven from a line shaft on the floor below by chain.

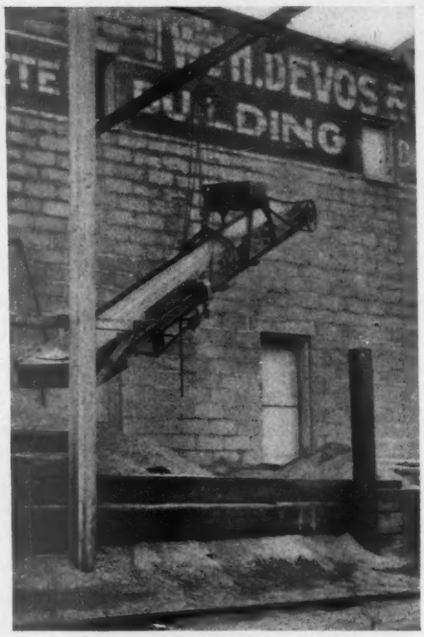
On the lowest floor are the three block machines. Two of them are large power Anchor machines and are located directly below the two mixers so that the material flows through hoppers in the floor directly to the machines. The other machine is an Anchor Junior and is set beside the two larger machines. This machine is supplied with wet concrete from the nearest mixer by means of a home-made drag conveyor running along the floor above, which delivers the concrete when the hopper to the larger machine is closed. This conveyor is operated by the same motor that drives the bag cleaner. The two larger machines will produce approximately 2000 blocks each in a ten-hour day, while the small machine will make 1200 blocks in the same time. The machines are powered by 15-hp. Louis Allis motors. The company makes chiefly 8x8x10-in. plain and rock-face block, but also makes 8x8x8-in., 8x8x12-in. and 8x8x16-in., as well as sills, pier blocks, chimney blocks, and other building specialties.

Curing the Products

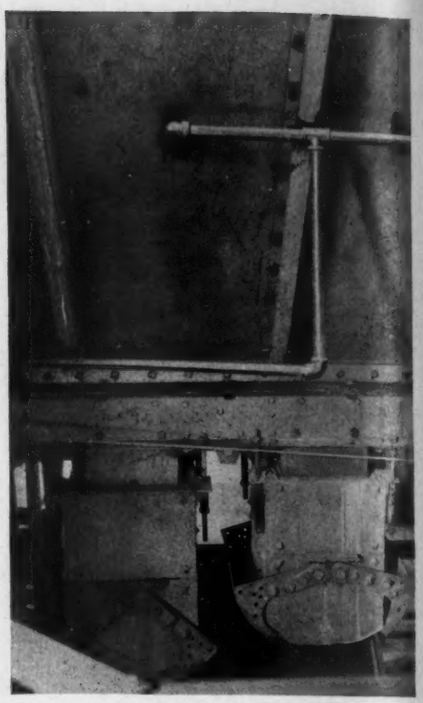
There are four curing rooms, each approximately 60x10x6 ft. in size. Each kiln contains three tracks having an 18-in. gage. The curing rooms are only open at one end and along this end there is a transfer track which brings the block from the tracks beside the machines and, after curing, carries them to the yard outside. The kilns would be able to turn out close to 900,000 blocks if necessary, but that would be forcing them.

Each curing room is provided with two end doors, each 5 ft. wide and each swinging separately on Illinois hinges. A ¾-in. pipe containing live steam is run along the floor of each kiln, with two discharge openings, one 15 ft. from each end. The Devos company has not developed just what it considers a satisfactory ceiling for its curing rooms yet. One room has been in service for quite a number of years, and the other three were added two years ago when an addition was made to the plant. At that time the ceiling was built of boards and building paper with an air space above, but it was found that this was not satisfactory and it is being taken out at present. The lumber being removed is considerably charred. A dipped pine sheeting will be used in the future.

An interesting feature of the curing rooms is the marine fittings for the lights, the glass covers serving to keep out the water. The



Loader for conveying material from outside bins



Detail of bottom of material bins showing batching boxes

Plant and yard of the Wm. H. Devos Co., showing how bins are located at the top of the plant to allow gravity flow of materials

cars used in the kilns are made by the Chase company and have three racks to hold 28 blocks of the 10-in. size. In curing, the block are given seven to eight hours of live steam and then are dried by heating with heating coils.

A 40-hp. portable firebox Kewanee boiler with an automatic water feeder furnishes the steam for the curing and drying. The return is brought back by an automatic electric pump to the boiler. The workroom on the

William H. Devos, president and founder of the company

lower floor is heated from the boiler by a "Venturafin" unit heater made by the American Blower Co. of Detroit. The garage below the office is also heated from the boiler by means of heating coils.

Plant Buildings

The plant of the Devos company is constructed of concrete block and is built on grounds 240x125 ft. The building as it now stands measures 50x70 ft., since an addition was added two years ago. This addition contains the three extra curing rooms, the private garage of the company, and on the second floor the general office. This arrangement of the office on the second floor has proved very satisfactory, since it took it away from the dust and noise of the shop, and yet kept it near enough to allow ample supervision of the plant from the office. The former office, on the first floor, was continually filled with steam from the curing room. The plant as now operated will employ about 18 people for capacity production, and for the average daily run 15 people are employed. The storage capacity for block in the yard is approximately 80,000.

The Devos company employs one salesman in the field at all times. The market sold is practically limited to the city of Milwaukee and its environs, so that the distribution is all by motor truck. The company contracts for the trucks used in delivering the block.

Plant Development

Wm. H. Devos first started manufacturing cement products in 1913, and has been closely identified with the making of units ever since that time. The first operation was at a small leased location not far from the present plant site. It was at this location that Mr. Devos installed the first machine stripper in the Milwaukee territory in 1915. It was here that he developed the production of rock-face block on a stripping machine using a rock-face plate in conjunction with the Hayden stripper which was in use at the plant at that time. This production is common on machines now, but it was an innovation at that time. Similarly, the development of a 16-in. block in place of the old 20-in. block then commonly produced was another innovation of the Devos company.

The new plant was built in 1920, and there have been a number of changes in it since that time, so that it now represents a very good example of the gravity plant. Naturally, with the efficient handling of materials and products the production of the plant was materially increased. As a further means to creating efficient production methods, a system of reports from the plant foreman is in use, and these daily reports show exactly what the status of the day's run of block is. Another innovation, which did not prove so successful, was the attempt to crush broken blocks for use as aggregate again. It was found that the expense of this work did not merit the bother taken.

The history of the Devos company is closely allied to the history of concrete units in Milwaukee in general. When the city passed a building code in 1912, requiring cer-

Arthur W. Devos

tain tests for concrete units, there were a number of companies which were supplying a much inferior product. Wm. Devos saw the opportunity for the production of a really good block and started out on this basis. However, the code was not enforced, and the better, but more expensive, blocks were not in demand. It was a hard fight at first, but working with a number of other producers who were anxious to see reliable units placed on the market, the Devos company helped to bring about the elimination of poor blocks in the district. Now the units in the Milwaukee territory, and throughout Wisconsin, are recognized as being of exceptional standard of quality.

Organization of the Company

The Devos company was incorporated in 1923 by Wm. H. Devos and his sons. At present only one son, Arthur Devos, is actively interested in the company. He is secretary and treasurer, as well as being superintendent of the plant. The elder Mr. Devos is president of the concern, while another son, John A. Devos, is vice-president.

Comparative Tests on Concrete Cylinders of Different Sizes

A SERIES of 216 concrete cylinders, mixed and made in the field, half of which were 8 by 16 in., and the remainder 10 by 20 in., were recently tested at the U. S. Bureau of Standards. The object of the series was the determination of the comparative strengths developed by the two sizes of specimens, using local sand and gravel under field laboratory conditions.

The cylinders were made in a small field laboratory, the concrete being mixed in a small batch mixer. Each batch was large enough to make four 8 by 16 and four 10 by 20 in. cylinders. After mixing to the desired consistency, the batch was emptied into a wheelbarrow and a shovelful was placed into each of the paper cylinder molds in success until filled. Each cylinder was properly tamped during filling.

Three mixes were used, 1:1:2, 1:1½:3, and 1:2:4. The 1:1½:3 and 1:2:4 were tested at 3, 7, and 28 days. The 1:1:2 mix was tested at 3 and 28 days. For each proportion the concrete was mixed to three consistencies giving the approximate slumps at 2, 4½, and 6½. Since the cylinders in each group have the same amount of cement, water, aggregate, and mixing time the strength ratio of the 10 by 20 and 8 by 16 should be unaffected by many of the variables which enter cylinder making when duplications of mixes are attempted.

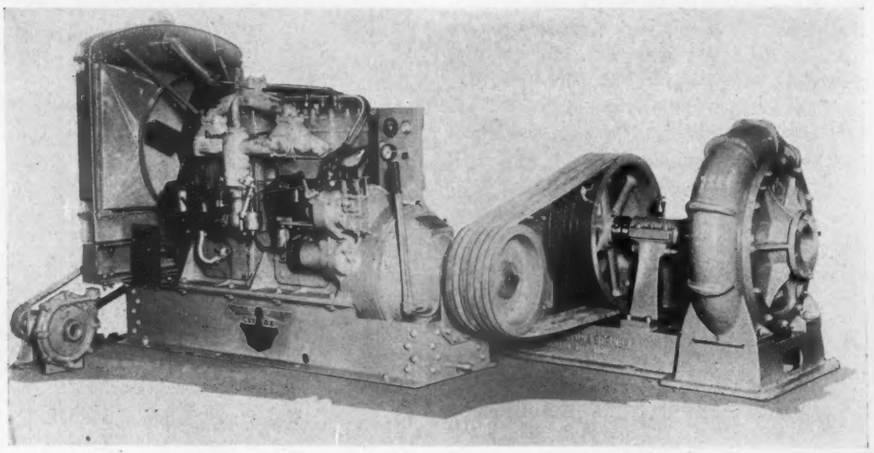
The average strength of the 10 by 20 in. cylinders was 96% of the average strength of the 8 by 16 in. cylinders. The strength ratios were 92, 98 and 96%, respectively, for the 1:1:2, 1:1½:3, and 1:2:4, respectively.

In connection with the testing of cylinders of several sizes, it is important to note that if tested in one machine at the same platten speed the increase in strain will be slower for the small specimens, a phenomenon observed and noted in the test of mine stoppings and by Prof. D. A. Abrams. The strength ratios were opposite to what might be expected because of this effect.—*Technical News Bulletin* of the U. S. Bureau of Standards.

New Machinery and Equipment

Unique Drive for Sand Pumps

THE CLIMAX ENGINEERING CO., Clinton, Iowa, offers a unique drive for sand pumps where it is not advisable to direct connect the engine to the pump. This drive is suitable for installations on barrel type dredges to pump sand and gravel from the bottom of a river or lake to a sorting or screening bin on the shore or at the top of a hill.



Sand pump driven by a gasoline engine through a short center rope drive

The illustration below shows a recent installation using a Climax Model R4U, 6x7-in., 85-hp. engine, connected to a 6-in. sand pump (Hetherington and Berner) with a special drive taken from the engine by a twin disc inclosed clutch and through a Texrope drive which furnishes the necessary speed reductions between the engine and the pump, permitting the engine to operate at 950 r.p.m. and the pump at 625 r.p.m. Provision is also made for driving a service or priming pump from the front end of the engine.

The entire unit operating together is claimed to have delivered water at the rate of 1000 g.p.m. or 30 cu. yd. of solids to a maximum height of 60 ft.

New Line-Start Induction Motors

A LINE of squirrel cage induction motors suitable for starting on full line voltage is being placed on the market by Allis-Chalmers Manufacturing Co. These motors are normal torque, high reactance machines and will not draw starting current in excess of the limits recommended by the Electrical Apparatus Committee of the National Electric Light Association. They are built in ratings 7½- to 30-hp, 600 to 3600 r.p.m., low voltage, and are available with either sleeve or roller bearings. All features of Allis-Chalmers construction as employed in squirrel cage motors are maintained in this new line. A magnetic switch with push button control is the only starting equipment required.

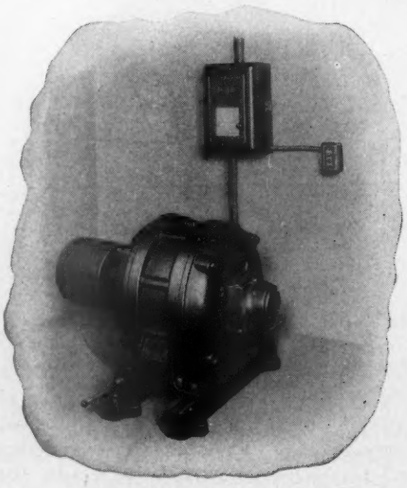
New Rotating Derrick

ONE OF THE most recent developments in hoisting equipment is the new Dobbie full-rotating derrick, manufactured by the Dobbie Foundry and Machine Co. and distributed by the Mundy Sales Corp., New York, N. Y. The new machine has many possible uses in the rock products industry, particularly in sand and gravel excavation. The manufacturers point out that the derrick can be mounted on a car and used in sand and gravel pits or in quarries. It can also be mounted on a barge for floating service, its full swing being of considerable advantage in this use.

The Dobbie derrick revolves on a single circular rail, on roller-bearing equipped wheels. It has an unusually fast swing, about 2.4 r.p.m., according to the manufacturers. The machine is of all-steel construction, including the 55-ft. boom with which it is equipped. It is operated by a three-speed Mundy hoist which is powered by a 60-hp. Waukesha gasoline engine.

The principal advantages of the rotating derrick, according to the manufacturers, are as follows: Full 360 deg. swing; flexibility, due to the three-speed hoist; ease in erection, only one-half day being required, it is said, and the absence of any guy wires.

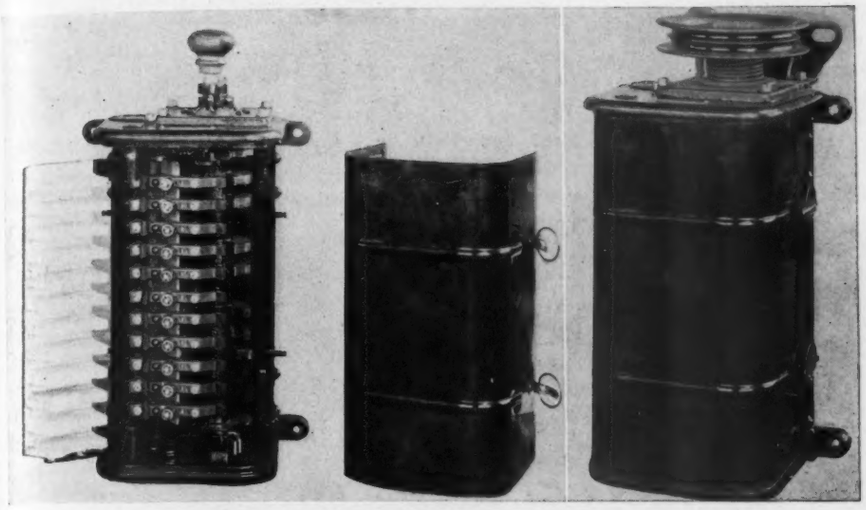
New full-rotating derrick



New squirrel-cage motor suitable for starting on full line voltage

New Drum Switches

THREE NEW drum switches are announced by the General Electric Co., Schenectady, N. Y. for use with squirrel-cage and slip-ring motors. They have been designed particularly for the control of small cranes, hoists, machine tools, etc., but can be applied to advantage on any work where a small and inexpensive drum switch is desired for the control for the types of motor mentioned.



Left—New drum switch with horizontal handle and, center, casing for new switch. Right—Drum switch with rope wheel and spring return

The CR-3200-1250-A is a primary resistance drum switch for squirrel-cage motors, providing four points forward and four points reverse. It is suitable for motors that do not have an overhauling load; that is, on hoists, this switch can be used where worm gearing or automatic mechanical load brakes are used.

The CR-3200-1250-B is a primary resistance switch for squirrel-cage motors, providing four points forward and one point reverse. This switch is suitable for use where there is an overhauling load; that is, on hoists, this switch should be used where a worm gear or automatic mechanical load brake is not used. In such a case one point reverse is provided so that the motor will exert sufficient torque to prevent excessive motor speeds when overhauled by the load.

The CR-3202-1308-A shown herewith is a primary and secondary reversing switch for slip-ring motors, providing five points forward and five points reverse. It is suitable for starting duty or speed-regulating duty, and for use with 220-, 440- and 550-v. motors rated 15-hp. and less, where a five-point switch would be chosen.

All three switches have the same frames, but the cylinder developments are different. Horizontal handle, vertical handle and rope wheel and spring return attachment are interchangeable.

New High-Speed Electric Hoist

THE American Hoist and Derrick Co., St. Paul, Minn., has brought out a new design of a high-speed electric hoist for general industrial uses and adaptable to rock products operations. Many new features are claimed for the new "American" hoist, among which are ruggedness of construction, large shafts, machined drums to insure even pull and smooth movement of loads, large diameter frictions, enclosed silent chain running in oil, large brakes and additional safety brake, mounted on the pinion shaft.

Interchangeable electrical equipment is provided for use with either a.c. or d.c. power. Complete information on the new machine is contained in a booklet just issued by the American Hoist and Derrick Co.

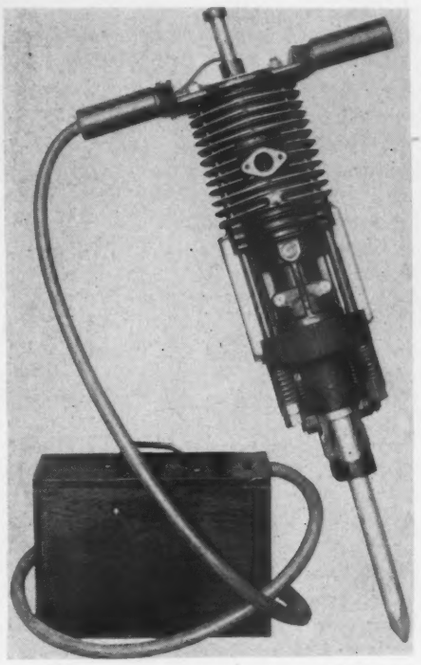
New Gasoline Hammer-Drill

THE Milwaukee Gas Tool Corp., Milwaukee, Wis., has developed a new gasoline hammer, the "Rodax," which can be used with a cutting tool as a jackhammer drill, although its primary purpose is for pavement breaking. The new machine is simply and ruggedly constructed and the maker's claims of some unusual features are justified in that it has no flywheel, connecting rods, cam shaft or bearings. The piston operates as the hammer, the blows being transmitted through an anvil direct to any standard cutting tool which may be used. The entire unit is self-sustained and weighs about 85 lb.

The "Rodax" will be manufactured by the Le Roi Co., Milwaukee, for the Milwaukee Gas Tool Corp., who will market it through distributors.

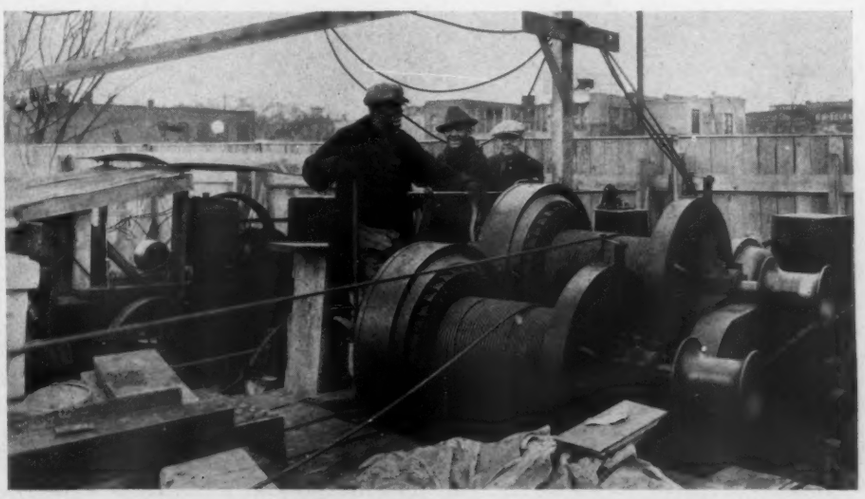
Butt Welding Machine Operates with Carbon Arc Process

A NEW butt welding machine operating with the carbon arc process is announced by the Lincoln Electric Co., Cleveland, Ohio. The arc butt welder, it is claimed, is not an alternative method of doing butt welding but a solution to a class of butt welding problems which the resistance welder cannot solve. Some of its applications are said to be in welding plugs into tube ends, small diameter bar to larger diameter bar, etc.



New gasoline hammer drill

With the arc butt welder, the welding heat is applied to the joint by the carbon arc and the bars revolved to distribute the heat uniformly. Pressure is applied to squeeze out the slag and complete fusion. The motor generator set used to supply current for the arc gives d. c. power at 40-60-v.



New high-speed electric hoist for industrial purposes

Northwestern States Portland to Open Gilmore City Plant for Stone Production

THE Northwestern States Portland Cement Co. of Mason City, Iowa, will open the quarry at its cement plant at Gilmore City, Iowa, about the first of April, according to an announcement of officials of the company. This plant, which has been closed since its purchase by the Northwestern States company about two years ago, is scheduled to begin shipping crushed rock within a month, and may resume the manufacture of cement at a later date. The renewed activity is reported to be due to the projected extensive road-building program in that section of the state. Machinery and equipment which was transferred to the Mason City plant last summer has been returned to the Gilmore plant and is now ready for use. This plant was erected in 1919, and at the time of the sale there was outstanding stock amounting to $1,111,200. The Northwestern States purchased the plant for $600,000, with an additional $100,000 for equipment.

Georgia Portland to Build Plant Near Atlanta

ACCORDING to recent reports in southern newspapers, the Georgia Portland Cement Co. of Augusta, Ga., is contemplating the construction of a 500,000 bbl. mill on the Savannah river near Augusta. The site is said to be particularly advantageous, as it has good river transportation and being well equipped with rail facilities by the lines serving Atlanta. It is not stated when this plant will be constructed, but it is understood to be the company's second unit in its construction program, and will follow shortly after the completion of the first unit at Sandersville, Ga. As previously reported in ROCK PRODUCTS, the Georgia company is to start immediately on the Sandersville plant, the work to be done by H. K. Ferguson Co., engineers of Cleveland, Ohio.

Canada Cement Company Buys Manitoba Gypsum Company

ACCORDING to a recent report, the Canada Cement Co. has purchased the property of the Manitoba Gypsum Co. at Winnipeg for a sum approximating two and a half million dollars and it is thought that the purchase foreshadows a big development in the cement company's operations in the west. It was stated some time ago that the cement company intended making large extensions to their mills in Winnipeg and the purchase of the gypsum company's plant is believed to be part of this program. The Manitoba company is one of the largest industrial establishments in Manitoba. It owns large mills at St. James, near Winnipeg, and holdings of valuable gypsum lands at Gypsumville, Manitoba, which have been operated continuously since 1900. The Canada Cement Co. has been a large user of the uncalcined gypsum for the manufacture of cement and by this purchase will control these gypsum deposits. The new development will undoubtedly mean an increase in the cement company's output. The Manitoba company has done a large business in manufacture of gypsum insulations, oriental stucco, wallboards and acoustical plaster, as well as supplying gypsum for use in cement.

New Corporation to Develop Canadian Silica Sand Deposits

DEVELOPMENT of an entirely new deposit of silica sand and fire clay in northern Ontario is reported to be progressing rapidly, according to a statement of William Douglas, president of the Northern Ontario China Clay Corp., which is exploiting the property. Before the summer of 1928 the corporation expects to have its plant complete on the east bank of the Mattagami river, eight miles north of Smoky Falls. The company is assured of transportation, since the end of the Timiskaming and Northern Ontario R. R. is now at Coral Rapids, only 12 miles from the plant site, and a survey has already been completed for the remaining distance. The company plans to be prepared to ship over the new line this summer, and even if the line is not completed, it will probably ship some of its product, anyway. Lack of transportation has kept this deposit from being worked previously, although it was discovered a number of years ago.

The property of the Northern Ontario corporation consists of nearly 400 acres, containing deposits of three general materials, fire clay, silica sand and china clay. The fire clay is described as being a very high grade refractory material, and the china clay is said to be equal to the best English china clay. The silica sand is reported to be of an exceptionally good grade, and almost pure. The plant will produce a number of by-products, including mica powder, carborundum, aluminum oxide, and similar products, which Mr. Douglas says can be producde in marketable quantities. A very fine white sand is recovered in the bleaching process of the china clay, and it is so pure that it is available for use in the production of optical glass and lenses.

The company is incorporated for $6,000,000, of which $4,000,000 will be issued. However, none of this will be offered to the public until after the plant is completed and in operation. It is expected that the company will have about three-quarters of a million dollars as working capital when it starts work.

Nast Co. Preparing to Open Quarry at Marblehead, Wisconsin

PREPARATIONS are being made by the Nast Lime and Stone Co. of Eden, Wis., to start quarry operations in the vicinity of Marblehead, Wis. A crew of men is now at work clearing land on the old William Nast homestead, and equipment for quarrying will be installed shortly. Kilns for lime burning will also be erected. There are approximately 90 acres in the tract controlled by the Nast company, the greater part of which is a limestone ledge with stone sufficient to supply the company for many years.

The company was recently incorporated for $50,000 by Edwin Nast, a son of the late William Nast, who was one of the founders of the Nast Bros. Lime and Stone Co. The latter company established a quarry at Marblehead many years ago, which was later absorbed by the Western Lime and Cement Co. of Milwaukee. The site of the new quarry adjoins the property of the Western company.—*Fond du Lac* (Wis.) *Reporter.*

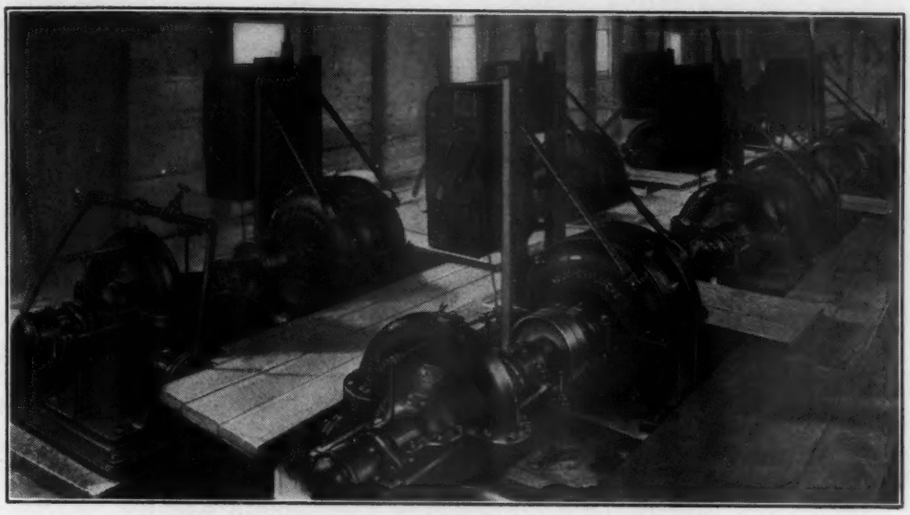
Iowa Supreme Court Decision Is Aid to Cement Companies

ACCORDING to a decision of the Iowa supreme court recently, the Hawkeye Portland Cement Co. was discriminated against when the tax board of review of Madison county refused to grant a reduction in taxes on the company's property. The court held that an assessment of $135 an acre on 780 acres of land was excessive, and did not sustain the county's contention that the limestone content and the supposed profit from the manufacture of cement on the property constituted a fair basis for such a high assessment. The court also declared that the land in question was entirely unsuited for agriculture, and that the manufacture value of the limestone would properly fall into another class of assessments. This decision should be of importance to other cement and quarry men in future cases of this kind.

Monolith Portland to Expand and Improve Tehachapi Cement Mill

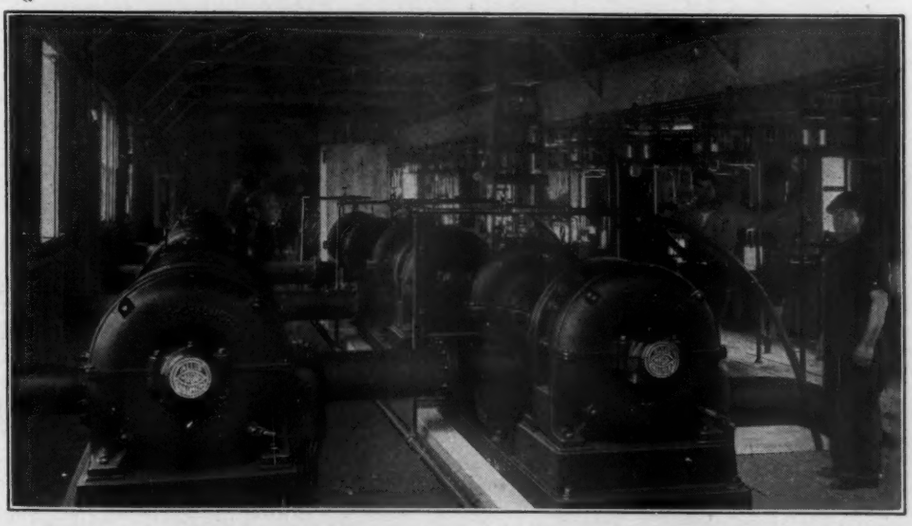
THE Monolith Portland Cement Co. of Los Angeles, Calif., is planning to expand its plant near Tehachapi, Calif., at a cost of approximately a quarter of a million dollars, according to a recent announcement from officials of the company. It is not stated when it is expected that the work will be completed. The report points out that the improvements were necessitated by orders already booked for more cement than the existing facilities can supply.—*Los Angeles* (Calif.) *Record.*

CENTRIFUGAL PUMPING UNITS
WHICH WILL HELP OUT IN THE HARD PLACES



6-8" types pumps with 125 h.p. motors sluicing earth for Toronto Reservoir Dam. Fred T. Ley & Co., Inc., Contractors.

Any process or undertaking requiring the use of centrifugal pumps can be materially helped or hindered by the kind of pumps and their proper application. Allis-Chalmers centrifugal pumps with Allis-Chalmers motors are the kind of units that help, and our representatives can assist you in their proper application. On two recent construction jobs contractors had to build large earth-filled dams, and Allis-Chalmers Centrifugal Pumping Units were selected for hydraulic sluicing service. The high reliability factor of our units was of great assistance in the satisfactory completion of the work and the contractors were highly pleased with the performance of the Allis-Chalmers Centrifugal Pumping Units of combined responsibility.



6-10" types pumps with 200 h.p. motors sluicing earth for dam for Northern N. Y. Utilities Inc. U. G. I. Co., contractors.

ALLIS-CHALMERS
MILWAUKEE, WIS. U. S. A.

News of All the Industry

Incorporations

California Talc Co., Wilmington, Del., $150,000.

Walkill Sand and Gravel Co., East Orange, N. J., 2,500 shares common stock.

Consumers Sand Co., Shannon County, Kansas, 15,000 to 140,000 shares, no par value.

Missouri Asphalt Corp., Wilmington, Del., $1,500,000. To deal in asphalt, cement and rock.

Peoples Sand and Supply Co., Wichita, Kan., $10,000. To pump sand on the Little river.

Colby Gravel Co., Granville, Ill., $50,000. H. K. Ward, N. H. Colby and H. L. Packingham.

Associated Rock Co., Los Angeles, Calif., $500,000. H. W. Jones, G. W. Grabe and Edward Schlee.

Black Marble and Lime Co., Enterprise, Ore., has increased its capital stock from $250,000 to $350,000.

Wheeling Patent Block Co., Wheeling, W. Va. To manufacture cement building block. J. R. Flynn, 205 N. York St.

Mount Carmel Sand and Gravel Co., Mount Carmel, Ill., $30,000. V. N. Rehnquist, Henry W. Seitz and A. C. Rehnquist.

Arvid C. Nestor Co., Inc., Minneapolis, Minn., $50,000. To manufacture concrete products. Jack Nestor, 3040 N. E. Pierce, and others.

Diamond Gravel and Navigation Co., Buffalo, N. Y., 200 shares, no par value. E. E. Becker, 17 Parkside Ave.; F. H. Holtz, C. H. Lanctot and F. C. Westphal.

Union Sand and Gravel Co., Wichita, Kan., $50,000 and 1,000 shares no par value. To pump sand from the Big Arkansas river. B. F. Hegler, Wichita, attorney for the company.

Trimmer Sand, Gravel and Limestone Co., Morristown, N. J., $300,000. Lambert Trimmer and Elizabeth Trimmer of Middle Valley, N. J., Dr. Clifford Mills and Lena Mills. The company plans to conduct a sand and gravel business with pits and quarries in Middle Valley.

Quarries

Biesanz Stone Co., Winona, Minn., is installing new machinery to enlarge the production capacity of the plant.

John B. Dymond, Scranton, Penn., has sold his stone quarry to the Schoentag Corp., contractors. The stone from the quarry will be used for highway construction near Scranton. An unusual feature of the deal is the agreement of the Schoentag Corp. to dam up the lower end of the quarry with strippings and make the property into a lake when they have finished with it. It is planned to do considerable landscaping around this artificial lake.

Sand and Gravel

West Michigan Core Sand Co., Muskegon, Mich., has changed its name to the West Michigan Sand and Fuel Co.

Newaygo Portland Cement Co., Grand Rapids, Mich., announces the removal of its sales office to the Grand Rapids Trust Co. Bldg.

Indiana Portland Cement Co., Indianapolis, Ind., sustained a small fire in its sack house recently which did several thousand dollars damage.

Lyman-Richey Sand Co., Omaha, Neb., has purchased land north of Plattsmouth, Neb., near Orepolis, and contemplates the erection of a sand plant on the property in the spring.

Southern California Rock Products Association, Los Angeles, has transferred its offices to 438 Bradbury Bldg., where it will continue under the direction of E. Earl Glass, manager.

Marquette Cement Manufacturing Co., Chicago, Ill., is installing a dust collecting system for the raw-grinding department of its La Salle, Ill., mill, furnished by the Northern Blower Co., Cleveland, Ohio.

Welston Iron Furnace Co., Jackson, Ohio, has let the contract to the Northern Blower Co. for a dust collecting system for both the raw-grinding and finishing departments of its cement mill at Superior, Ohio.

Tractor City Sand and Gravel Co., Janesville, Wis., is remodeling its plant at a cost between $20,000 and $30,000. The changes include the installation of new screens and motors and the remodeling of the buildings.

Missouri Gravel Co., Inc., Moline, Ill., will operate its plant at Louisiana, Mo., this year, according to James P. Pearson, president of the company. This plant was not operated last year because of a low demand for sand.

Sparks Brothers, Anacortes, Wash., are installing a new slack line excavating system and additional bunkers at their plant. A new well has also been dug to furnish water in place of the city water formerly used; the total cost of the improvement will be about $4,000.

Volunteer Portland Cement Co., Knoxville, Tenn., has appointed F. C. Parsons of Birmingham, Ala., as general sales manager. Mr. Parsons was formerly assistant sales manager of the Atlas Cement Co. with offices at Birmingham. He will begin at once to organize a sales force to handle the product of the company's new mill, which is rapidly nearing completion.

Monolith Portland Midwest Co., Laramie, Wyo., will be supplied with limestone from quarries 12 miles from the new mill which the company is now building. The Laramie Valley Railway Co. has been organized to build a line to connect the plant with the quarries. John A. Guthrie, vice-president of the Laramie First National Bank; A. W. McCullough, speaker of the Wyoming House of Representatives, and M. E. Corthell are the organizers of the company.

Cement Products

Borgert Bros., Long Prairie, Minn. The plant of the company is reported totally destroyed by fire.

John Morse, Red Bluff, Calif., general contractor, is installing machinery in his yards for the manufacture of cement blocks.

Mastic Cement Block Works, Mastic, Long Island, is preparing to manufacture "Supertile" as a new department of the business. Russell R. Ferrer is the owner of the company.

Babcock Concrete Block Co., Milwaukee, Wis., has disposed of its Kenosha, Wis., plant to Kenosha interests and will open a plant at Waukegan, Ill., to manufacture "haydite" cement block.

Concrete Building Units Co., Forest Park, Ill., is being organized to manufacture haydite blocks, and is expected to be in production within two months. A block machine is now being installed. H. E. Buchholz and Paul Huphold are the organizers of the company.

J. J. Collins, of the Collins Concrete Pipe Co., Portland, Ore., is one of the organizers of the Bellco Machine Co., of Portland, which has taken over the stock and equipment of Bell Ice Machine and Refrigeration Co. The new company will manufacture "Baby Bliss" concrete brick machines as well as ice machinery.

Gypsum

United States Gypsum Co., Chicago, Ill., has reduced the width of its "Gyplap" sheathing boards from 32 in. to 24 in., in order to provide greater convenience in handling the boards during construction work. The boards will remain 8 ft. long and ½ in. thick.

National Gypsum Co., Buffalo, N. Y., is installing a 30-in. Pennsylvania single roll primary crusher at its plant at National City, Mich., and not a hammer mill crusher as stated in the January 21 issue of ROCK PRODUCTS. The new crusher is capable of taking feed from a 2½-yd. shovel and reducing it to 4-in. to 6-in. size for secondary crushing.

Agricultural Limestone

Martin, Tenn. The N., C. & St. L. R. R. has donated sufficient agricultural limestone to treat the entire farm of the University of Tennessee at Martin, getting it ready for agstone demonstration purposes. The farmers of the community have raised $300 to put up a lime bin in the town.

Illinois Central R. R. is co-operating with producers of agstone and the farmers of western Kentucky by agreeing to deliver limestone at the most convenient points along its right of way, instead of only at stations.

Grandin, Mo. The business men of the city are establishing an agricultural lime storage bin to enable farmers to obtain any quantity of agstone at any time. The storage bin will also provide another outlet for producer's stone in that district.

Michigan Limestone and Chemical Co., Rogers City, Mich., recently shipped a train of 52 cars of agricultural lime from its agstone plant at Buffalo, N. Y., to Titusville, Va., and the neighboring towns. Twenty-five carloads were distributed at Titusville to the farmers of the surrounding territory, and the occasion was made a holiday, with the Michigan company giving away 30 tons of stone as prizes.

Miscellaneous Rock Products

Asbestos Shingle, Slate and Sheathing Co., Ambler, Penn., announce the election of R. E. Frey and J. E. Ledeboer as vice-presidents. H. R. Weaver has been elected secretary.

Blue Ridge Talc Co., Henry, W. Va., which recently sustained a fire at its plant, is now rebuilding the plant and contemplates the installation of equipment valued at approximately $60,000.

Personals

W. L. Home, consulting engineer, of White Plains, N. Y., recently spent a week at National City, Mich., doing consulting work for the National Gypsum Co.

Dr. George E. Ladd, economic geologist of the U. S. Bureau of Public Roads, has been appointed consulting geologist for the Armco Culvert Manufacturers' Association, Middletown, Ohio.

N. C. Taylor, Staunton, Va., has recently resigned as sales manager, assistant secretary and treasurer, and director of the Augusta Lime Co., Inc., of Staunton, and is no longer connected with that firm.

Robert G. Farmer, sales representative for the Columbia Chemical Division of the Pittsburgh Plate Glass Co. since 1924, has resigned his position to accept a position with the Crescent Portland Cement Co. as contract representative in eastern Ohio.

Dr. E. F. W. Alexanderson, consulting engineer of the General Electric Co., was presented the John Ericsson medal at the 40th anniversary banquet of the American Society of Swedish Engineers in New York, February 11. The award was given Dr. Alexanderson "for his outstanding contributions to the field of radio engineering." This medal, which was originated in honor of Captain John Ericsson, has been awarded only once before.

Manufacturers

Barber-Greene Co., Aurora, Ill., recently established a branch office in Cincinnati, Ohio, under the supervision of Paul Frederick, district manager. The office is in the Temple Bar Bldg.

Orton Crane and Shovel Co., Chicago, Ill., at its annual meeting at Huntington, Ind., re-elected P. A. Orton, Sr., president and general manager and elected P. A. Orton, Jr., vice-president and sales manager. Mr. Orton, Jr., was formerly in charge of sales in the Chicago territory. Herbert Mertz was elected vice-president in charge of sales in the New York territory.

Lincoln Electric Co., Cleveland, Ohio, has retained A. M. MacFarland as general sales and development engineer. He will devote his efforts to the development and application of automatic carbon arc welding and will make his headquarters in Cleveland. The Lincoln company also announces the appointment of O. D. Fries as salesman in charge of consumer motor business in the Detroit territory.

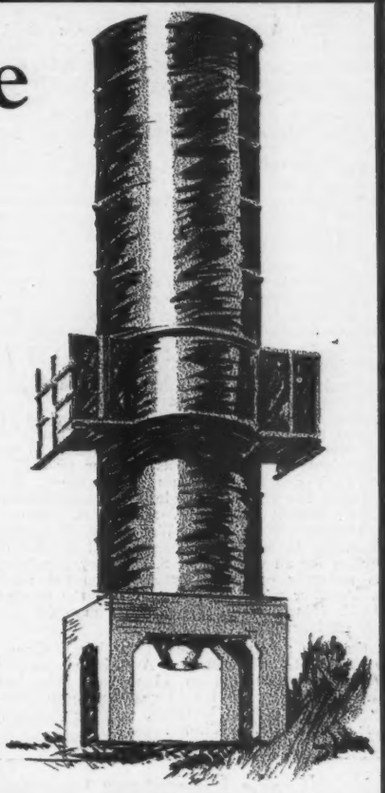
General Electric Co., Schenectady, N. Y. Four G. E. men have been named members of the American committee of the World Congress of Engineers to be held in Tokio, Japan, in November, 1929. They are E. W. Rice, Jr., honorary chair-

Lime Kiln Performance
can be predicted

THERE'S no element of uncertainty as to questions of capacity and efficiency with "Arnold" Kilns, designed and installed under the supervision of our "Centralized Control." If there ever existed any uncertainty, it has long since been dispelled; for "Arnold" Vertical Kilns were long ago accepted as being representative of the highest standards of kiln design, performance and economy.

In matters of fuel ratio to lime burning efficiency, the "Arnold" Kiln is unsurpassed. In every respect, it is thoroughly abreast of the industry's latest developments.

Send for copy of our new catalog. It gives complete details of our equipment and specialized lime plant engineering service.



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WOODVILLE, OHIO, U.S.A.

"Tungsco" Chrome Steel Nuggets

A new product made of "TUNGSCO" CHROME STEEL, a high quality rolled chrome alloy steel. The advantages of this steel, as a grinding medium, are—

1. **Better wearing qualities.**
2. **Complete elimination of breakage.**
3. **Greater grinding capacity.**

Sizes—5/8x1 1/4, 3/4x1 1/4.

Largest exclusive manufacturers of Grinding Media

COATES STEEL PRODUCTS COMPANY **Greenville, Illinois, U. S. A.**

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man of the board; Gerard Swope, president; C. C. Chesney, vice-president, and Professor Elihu Thomson, director of the Thomson research laboratory of the company. The appointments were made by Secretary of Commerce Herbert Hoover.

Traylor Engineering and Mfg. Co., Allentown, Penn., announce the appointment of D. A. Cheyette as assistant to District Manager R. R. Shafter. Mr. Cheyette has been connected with the Kennedy-Van Saun Mfg. and Engineering Co. for the past 12 years.

George D. Whitcomb, Rochelle, Ill., recently received an order for twenty 12-ton and ten 18-ton industrial locomotives from the Russian Imperial Railways Commission, which was represented in this country by the American Trading Corp. of New York City. The locomotives are to be used in the construction of 1000 miles of new railroad south from the present trans-Siberian railroad, through Turkestan to Afghanistan. This line will open up a hitherto almost inaccessible country. The Whitcomb company states that this is one of the largest orders for industrial locomotives since the close of the war.

Westinghouse Electric and Mfg. Co., East Pittsburg, Penn., announces the appointment of W. J. Longmore as consulting supervisor of sales; E. R. Norris as general works manager of all manufacturing operations; A. W. Bass as assistant to the vice-president; S. E. Marks as director of traffic; and C. G. Taylor as general purchasing agent. Announcement has also been made of the appointment of E. C. Brandt and F. J. Shiring as assistant works managers and of J. E. Webster as chief plant engineer. A. E. Kaiser has been named director of production for all works, and S. C. Hoey appointed works manager of the Homewood renewal parts work. Another recent appointment was the naming of D. F. Miner as manager of the material and process engineering department.

At the 15th annual banquet of the Westinghouse company's Veteran Employes' Association jeweled emblems were presented to 53 workers who had been with the company for 40 years or more. Secretary of Labor James J. Davis was the principal speaker at the veterans' dinner.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Welded Piping. Illustrated booklet on installing heating and plumbing systems with welding. LINDE AIR PRODUCTS CO., New York, N.Y.

Architectural Data on Sound Insulation. Bulletin on the use of gypsum products in obtaining sound insulation in buildings. U. S. GYPSUM CO., Chicago, Ill.

Soot Blowers. Illustrated bulletin on soot blowers for horizontal return tubular boilers and Scotch marine boilers. NATIONAL FLUE CLEANER CO., Groveville, N. J.

Hammermills. 24-page book on hammermills, illustrated with views of installations and drawings of the crushers. DIXIE MACHINERY MFG. CO., St. Louis, Mo.

Rotary Car Dumpers. Bulletin No. 103 on the advantages of rotary car dumpers with illustrations of various installations of the dumpers. ROBERTS & SCHAEFER CO., Chicago, Ill.

Multifoote Specifications for 1928. Illustrated catalog on cement mixers and pavers and allied equipment, with tables, charts and other data. FOOTE CO., INC., Nunda, N. Y.

Excavating Equipment. Bulletin No. 2707, a 16-page catalog of gasoline and electric excavating machinery, fully illustrated with views and diagrams. OSGOOD CO., Marion, Ohio.

Dorrco Filters. 10-page booklet illustrated with views of filter installation, and diagrams of the filters, with statement of features and method of operation. DORR CO., New York City.

Equipment for the Sand and Gravel Industry. Bulletin No. 354 of equipment listed for sale to the sand and gravel industry. WALTER A. ZELNICKER SUPPLY CO., St. Louis, Mo.

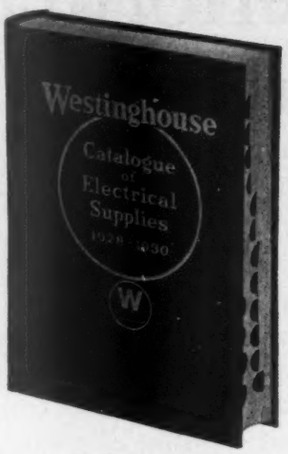
Starting and Operating Characteristics of Lincoln Motors. Illustrated bulletin showing with diagrams the characteristics of "Switch-Start" motors. LINCOLN ELECTRIC CO., Cleveland, Ohio.

Design of Furnaces for Pulverized Coal. A treatise by Martin Frisch on designing furnaces for pulverized coal, illustrated with diagrams. COMBUSTION ENGINEERING CORP., New York, N. Y.

Tapered Roller Bearings for Pinions. Announcement, illustrated with diagrams, of the features of roller bearings for pinion mountings on axles. TIMKEN ROLLER BEARING CO., Canton, Ohio.

De Laval Pumps at Haverhill, Mass. Illustrated four-page leaflet on the water works pumping equipment of the city of Haverhill, giving capacities and official data. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

1928-1930 Catalog of Electrical Supplies. Illustrated catalog containing approximately 1200 pages presenting the electrical and mechanical features and application information for all supply apparatus



New 1200-page catalog of electric supplies

and appliances manufactured by the company, and also describes a representative list of large motor and generator apparatus. WESTINGHOUSE ELECTRIC AND MFG. CO., East Pittsburgh, Penn.

Designing Concrete for Workability as Well as Strength. Bulletin No. 336, illustrated with pictures and diagrams, on controlling and improving the workability of concrete. CELITE PRODUCTS CO., Chicago, Ill.

Live Roll Grizzly. Illustrated bulletin on non-clogging live roll grizzly. **Belt Conveyor Carriers.** Illustrated bulletin on various types of carriers for belt conveyors. STEPHENS-ADAMSON MFG. CO., Aurora, Ill.

Liquid Soap Dispensing Systems. Illustrated catalog of soap dispensing systems for use in various industrial plants, such as cement mills or crushing plants. U. S. SANITARY SPECIALTIES CORP., Chicago, Ill.

Open End Rod Mills. 36-page illustrated catalog on the Marcy open end rod mill for grinding rock products, with information concerning both wet and dry grinding. MINE AND SMELTER SUPPLY CO., Denver, Colo.

How to Determine the Speed Reducer for Your Needs. An illustrated article reprinted from *Power Transmission*, covering in a comprehensive manner the selection of the reducer necessary for different installations. FOOTE BROS. GEAR & MACHINE CO., Chicago, Ill.

Products Plant Mixers. Illustrated bulletin on 9-ft. to 42-ft. concrete mixers for cement products plants. **Barrett Lift-Trucks.** Illustrated Bulletin No. 199 on lift-trucks for use in cement products plants. CONSOLIDATED CONCRETE MACHINERY CORP., Adrian, Mich.

Speed Reducers. Comprehensive illustrated Bulletin No. 48, on herringbone and spur gear speed reducers, containing illustrations and drawings of the parts of the speed reducers, as well as views of various installations, and tables for selecting speed reducers. PALMER-BEE CO., Detroit, Mich.

Giving Industry a New Definition of Dodge. Illustrated booklet showing the scope of the company's facilities and products. **An Invitation.** Announcement of the Dodge exhibit at the Midwestern Engineering Exposition at the Coliseum, Chicago, February 14 to 18. DODGE MANUFACTURING CORP., Mishawaka, Ind.

Gypsum Partition Tile. A treatise by Henry J. Schweim on the use of gypsum block for interior, non-bearing walls, fully illustrated with views of work in progress, as well as diagrams of fire-test data. Also includes specifications of A. S. T. M. for gypsum partition block. THE GYPSUM INDUSTRIES, Chicago.

Unit Coal Pulverizer. Illustrated bulletin on use of coal pulverizer. **Spiral Thickener and Clarifier.** Bulletin No. 31 on thickener using straight settlement principle without a bed of sand. **Ruggles-Coles Dryers.** Illustrated bulletin on dryers for various kinds of materials. **Machine Jobs.** Illustrated bulletin on the Steacy-Schmidt Mfg. Co., a subsidiary of the Hardinge Co. HARDINGE CO., York, Penn.

Wide Series and Utility Type Bearings. Catalog No. 4-A of cylindrical roller bearings, fully illustrated and furnishing data on size and capacities. **Bulletin No. 53.** Illustrated bulletin on self-aligning pillow blocks equipped with adapter type bearings to fit standard commercial shafting. **Bulletin No. 54.** Bulletin on various precision types of radial bearings. **Bulletin No. 55.** Illustrated bulletin on self-aligning pillow blocks equipped with standard bearings. **Bulletin No. 56.** Illustrated announcement of large bearings in the recently adopted international sizes. ROLLWAY BEARING CO., INC., Syracuse, N. Y.

Rolfe Prize in Economic Geology in Illinois Announced

C. W. ROLFE, professor emeritus of geology of the University of Illinois at Urbana, has offered a prize of $250 for the most valuable contribution towards a new, better, or increased use of any mineral resource of the state of Illinois.

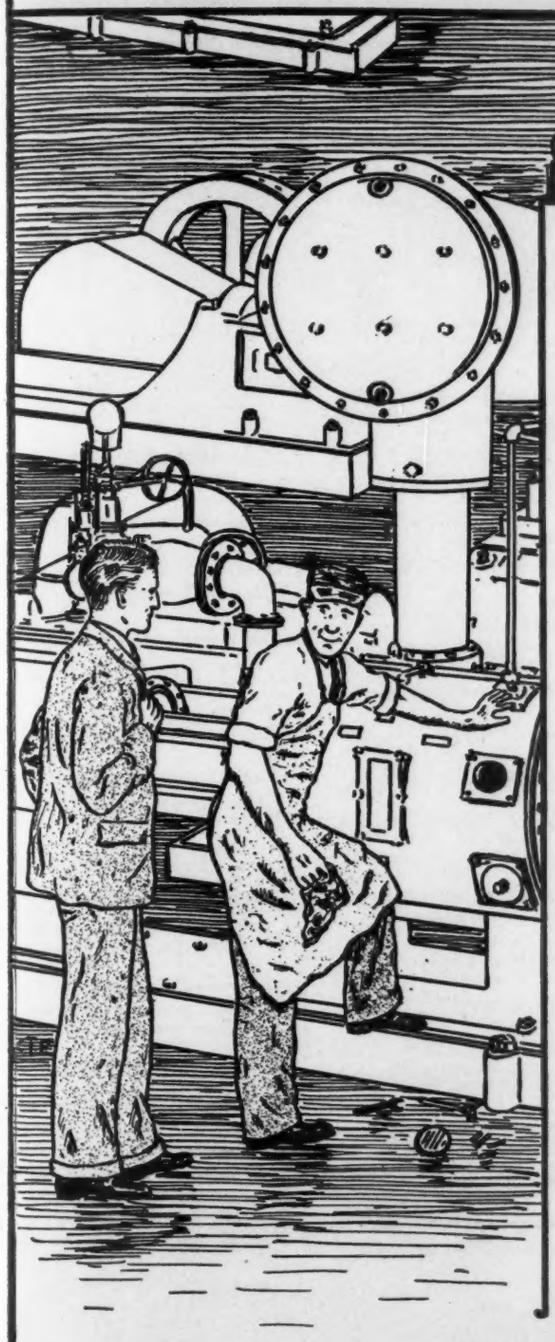
The investigation may take the form of the discovery of mineral deposits which are economically valuable, but not heretofore known as occurring in this state; or of such treatment of minerals, deposits of which are already known to occur in the state, as will add largely to their commercial value; or of new uses of any mineral resource of Illinois that will materially increase the market value of the resource; or of methods of recovery that will add considerably to the amount or quality of mineral which may be taken from the deposits; or, in short, anything that will make a worth-while addition to the variety, quantity, quality or usefulness of the mineral resources of the state.

The prize is open to anyone engaged in research, either privately, commercially, or in connection with any university or college staff, or any state or national bureau or survey. The work must have been done, or at least completed, during the year beginning May 1, 1927, and ending May 1, 1928. The submitting of papers, however, does not involve the surrender of any publication rights on the part of the author. The committee of award will be made up of A. C. Callon, professor of mining engineering, chairman; M. M. Leighton, director of the State Geological Survey; J. C. Hackleman, professor of farm crops extension; C. W. Parmelee, professor of ceramic engineering; T. E. Savage, professor of geology, and S. W. Parr, retired professor of applied chemistry.

Ohio Issues Bulletin on Shale in Lucas County

AMONG the recent bulletins from the Geological Survey of Ohio is one by Grace Anne Stewart on the "Fauna of the Silica Shale of Lucas County." This bulletin (No. 32 of the fourth series) concerns the characteristics of the bed of shale which overlies a heavy blue limestone layer in northeastern Ohio, and is particularly noticeable at Silica, Ohio, from which it derives its name. The report is of special interest to those who are concerned with the historical background of the Ohio geological formation, especially relating to the Hamilton age, although as a practical handbook it contains a comparatively small amount of material that could interest the rock products producer. It is well illustrated throughout.

"So Clean We Didn't Need To Wipe The Valves!"



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AIR FILTERS

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This was done as usual after Midwest Compressor Filters were installed. However, the valves were found to be so clean that they were replaced without even bothering to wipe them off.

The time consumed in the cleaning operation was forty man hours at over-time rate. The wear and tear of dust laden air on the compressor is difficult to estimate; so also is the saving in lubricating oil.

What a graphic tribute to the efficiency of Midwest Compressor Filters! As a matter of fact, the benefits of Midwest Filters are well worth while, even when the dust content of the intake air is comparatively low.

Type B **Box Filter**

Send for bulletin C-7 describing the complete Midwest line of compressor filters, together with performance data on same.

MIDWEST AIR FILTERS

INCORPORATED

BRADFORD, PA.

Offices in Principal Cities.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 128

Aerial Wire Rope Tramways
American Steel & Wire Co.
A. Leschen & Sons Rope Co.

Agitators, Thickeners and Slurry Mixers
Hardinge Co.
Morris Machine Works
Polysius Corp.
F. L. Smidth & Co.

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Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Pennsylvania Pump & Comp. Co.
Traylor Eng. & Mfg. Co.

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Northern Blower Co.

Air Line Oilers
Gardner-Denver Co.

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Valve Bag Co. of America

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Bates Valve Bag Corp.
Valve Bag Co. of America

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Bates Valve Bag Corp.

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Polysius Corp.
W. A. Riddell Co.
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Coe Mfg. Co.
New Departure Mfg. Co.
Timken Roller Bearing Co.

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New Departure Mfg. Co.
Timken Roller Bearing Co.

Bearings (Collar Oiling)
New Departure Mfg. Co.

Bearings (Radial)
New Departure Mfg. Co.

Bearings (Tapered Roller)
Timken Roller Bearing Co.

Bearings (Thrust)
New Departure Mfg. Co.
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Quaker City Rubber Co.

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Clamshell Cranes (See Cranes)

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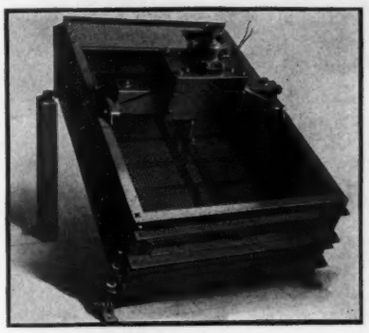
85% of former screening cost *is now profit!*



ONE operator writes that he has turned eighty-five per cent of his screening cost into clear profit by using a Hum-mer Electric Screen.

He keeps eighty-five cents out of every dollar that it formerly cost to screen his material.

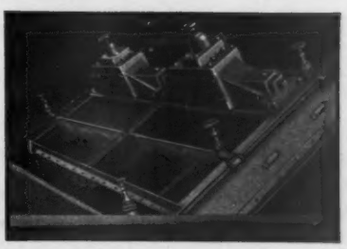
The saving in screening cost alone paid for the Hum-mer many times over the first year.

The experience of this operator suggests the large profit possibilities of the Hum-mer. Increases in capacity and efficiency of separation due to the Hum-mer make screening far more profitable.

The Hum-mer leads the world in accurate and thorough screening of large tonnages.

It will pay you to investigate what the Hum-mer will do for you. Send for the book, "Screening for Profit."

THE W. S. TYLER COMPANY, *Cleveland, O.*
***Manufacturers of* Woven Wire Screens and Screening Equipment**



Hum-mer *Electric* Screen

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Dredge Pipe (See Pipe)

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Drills (Rock)

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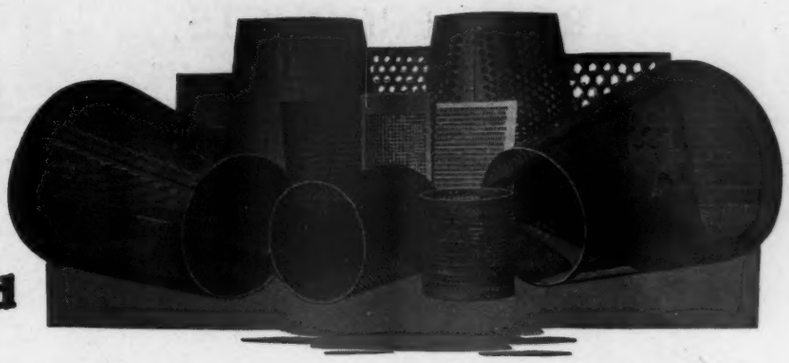
W. A. Jones Fdy. & Machine Co.
Palmer-Bee Co.

Generators (See Motors and Generators)

Grab Bucket Cranes (See Cranes)

Cross Screens & Perforated Metals



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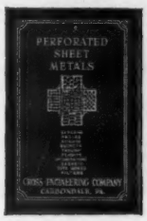


A copy of our catalog will help you to select and specify to best advantage.

Whether it is A-1 quality, prompt shipment or reasonable cost that interests you most; you will find "Cross" screen plates and sections satisfactory.

Repeat orders are a necessity to us, and we know to deserve them every shipment must be right.

Ample capacity, a large stock of material and close attention; insure your needs being met when you buy from Cross.

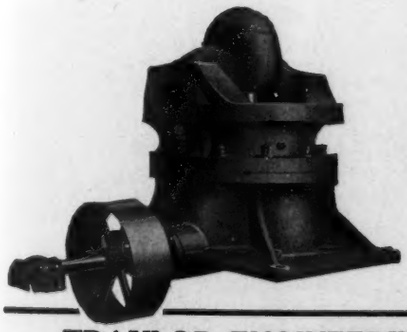
Cross Engineering Company

Office and Works: CARBONDALE, PA.

Send for our new catalog; just off the Press.

TRAYLOR bulldog

gyratory finishing crusher



A FINE reduction gyratory crusher of the most improved design, the Traylor Bulldog has proved a most efficient and economical unit in a large number of plants where it has been installed. This machine has gained an enviable reputation for exceptional sturdiness and durability—as well as being a ***big producer.*** Built in five sizes from 4½-in. to 20-in. Bulletin No. 1109 gives full description.

We manufacture a complete line of equipment for cement and crushed stone plants.

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Acheson Graphite Co.

Graphite Powders
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Traylor Vibrator Co.

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Georgia Iron Works

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Gardner-Denver Co.
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Gardner-Denver Co.
Hyman-Michaels Co.
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Link-Belt Co.
Mundy Sales Corp.
Northwest Engineering Co.
Sauerman Bros.
Smith Engineering Works
Vulcan Iron Works.

Hose Couplings (See Couplings, Hose, Pipe)

Hose (Water, Steam, Pneumatic and Air Drill)
Chicago Pneumatic Tool Co.
New York Rubber Corp.

Hydrators (Lime)
Arnold & Weigel.
Jackson & Church Co.
Kritzer Co.
McGann Mfg. Co., Inc.
H. Miscampbell.

Hydraulic Guns
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UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA

Bankruptcy Sale!

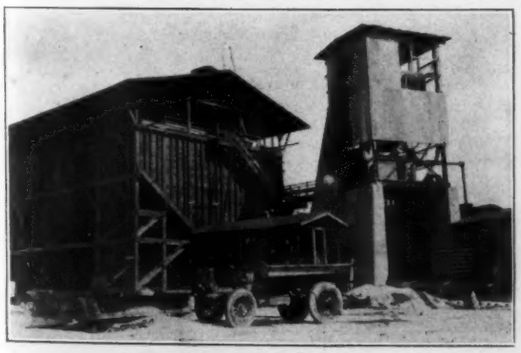
General view of the plant of Florida Rock Products Co., Brooksville, Fla. The Amiesite plant is at the left and is connected by conveyor with crushing plant at right

Florida Rock Products Co.

Crushed Stone and Amiesite Plant

To be Sold as a Complete Unit

Petition filed in bankruptcy has necessitated offering for sale by the trustee, on the 20th of April at 10:00 o'clock in the forenoon at the office of Hon. H. P. Baya, Referee in Bankruptcy, Tampa, Fla., the property and plant of the Florida Rock Products Co., Bankrupt, located in Hernando County, one mile out of Brooksville, Florida. This plant is located in the region where Tampa limestone occurs—the only limestone formation in the state suitable for producing a commercial crushed stone similar to that produced generally throughout the United States. The plant is modern and complete in all details, and is favorably located as regards labor and transportation facilities.



End of Amiesite plant showing elevator loading material for shipment

The property, plant and all assets with complete quarry equipment, is offered for sale subject to confirmation by Referee. For crushed stone producers interested in expanding their activities, this is a rare opportunity to acquire a plant at a real bargain as appraisement of assets is only 15 per cent of the assets as listed in the bankruptcy schedule. Inquiries are respectfully solicited.

General view of the crushing plant

Address inquiries to

L. L. BUCHANAN, Trustee

1201-2 Wallace S. Building **Tampa, Florida**

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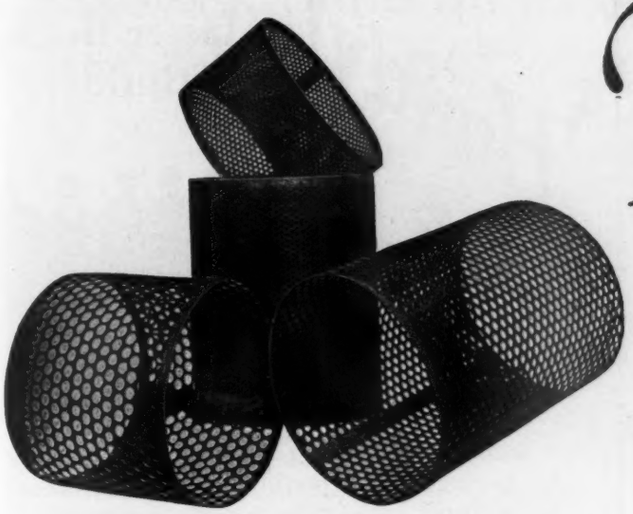


Toepfer screens

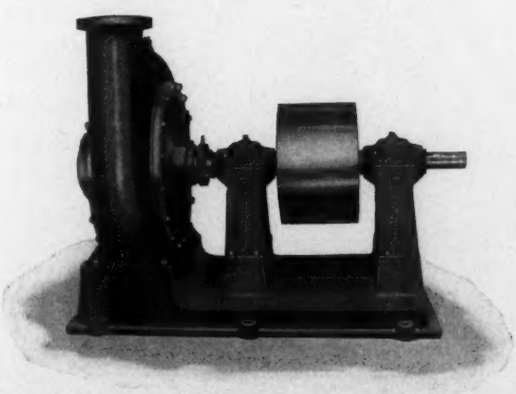
THE Toepfer line of perforated metal screens represents quality of the highest order possible to buy in this type of equipment. Under the most severe operating conditions, the service rendered by Toepfer Screens thoroughly bears out this assertion.

We are prepared to make up screen sections of any specifications—for any make or type of screen. To insure prompt deliveries we constantly carry in stock a large supply of high carbon steel plates of sizes generally used. All orders receive careful and prompt attention.

TOEPFER PRODUCTS
Sand Washers, Elevators, Bin Gates, Washing Screens, Feeders, Grizzlies, Conveyors, Perforated Metals.

W. TOEPFER & SONS COMPANY
Milwaukee Wisconsin

A NEW TYPE SAND PUMP



6 inch Right Hand Top Discharge Type B Belt Driven Sand and Dredging Pump
Shipping weight 2,600 lbs. Floor space 2'-9" x 4'-8"

THE accompanying cut shows a new type pump developed to meet conditions of service that are too severe and heavy for the standard type of belt driven sand pumps.

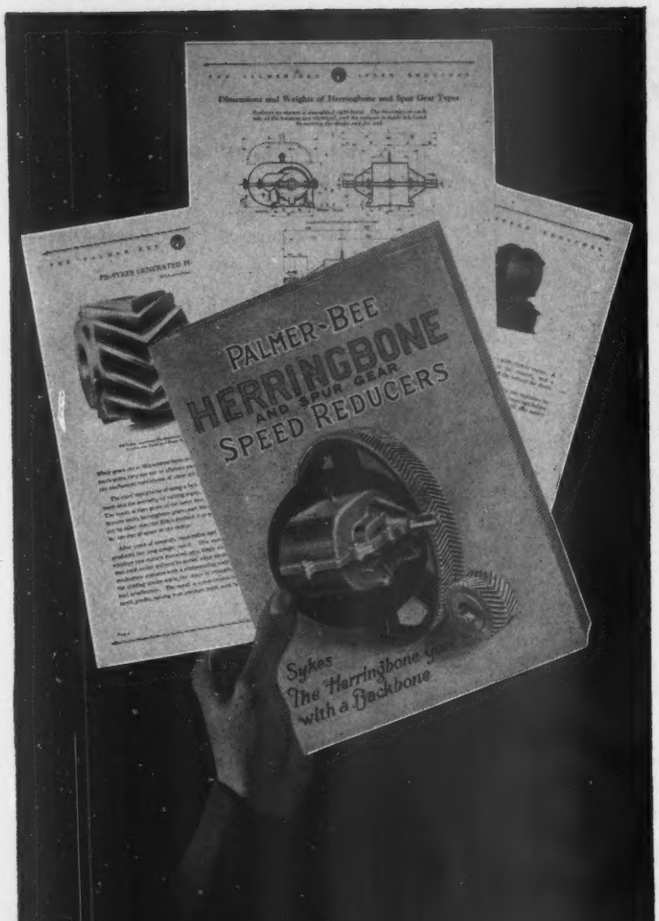
The design and construction are such that while heavy and rigid, the cost is much less than the strictly heavy duty type and but slightly in advance of the standard type. These pumps (at present built in 6-in. and 8-in. sizes only) carry a number of highly desirable features and have met with much favor among experienced users.

These pumps can be supplied in right hand or left hand with position of discharge top or bottom. Extended shaft is furnished so that direct connection can be made if desired.

Prices and descriptive sheets sent on request

GEORGIA IRON WORKS

AUGUSTA, GEORGIA
Established 1891



Get this new catalog on Herringbone and Spur Gear Speed Reducers.

CONTAINS a table of service or wear factors, enabling the user to select the correct size reducer for any condition ranging from the most favorable to the most severe.

Also tables of ratios and horsepower capacities of standard sizes, as well as dimensions, weights, maintenance instructions and other valuable information:

The edition is limited, hence we would suggest writing for your copy today.

PALMER-BEE COMPANY
1705-15 Poland Ave. Detroit

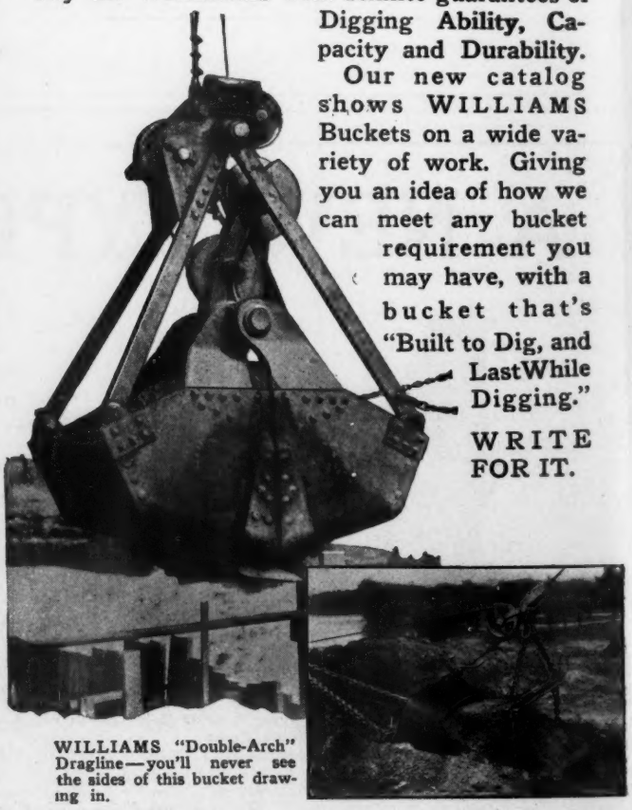
"Howdy!" "Meet these Master Bucket Builders

When you visit our plant you'll see many bucket building experts who have specialized in this work here for ten years and more—also some father-and-son combinations that show how building better buckets can be an inherited talent.

And because these men take real pride in ***building buckets up to a standard and not down to a low competitive price,*** you can buy the WILLIAMS with definite guarantees of Digging **Ability, Capacity and Durability.**

Our new catalog shows WILLIAMS Buckets on a wide variety of work. Giving you an idea of how we can meet any bucket requirement you may have, with a bucket that's "Built to Dig, and LastWhile Digging."

WRITE FOR IT.

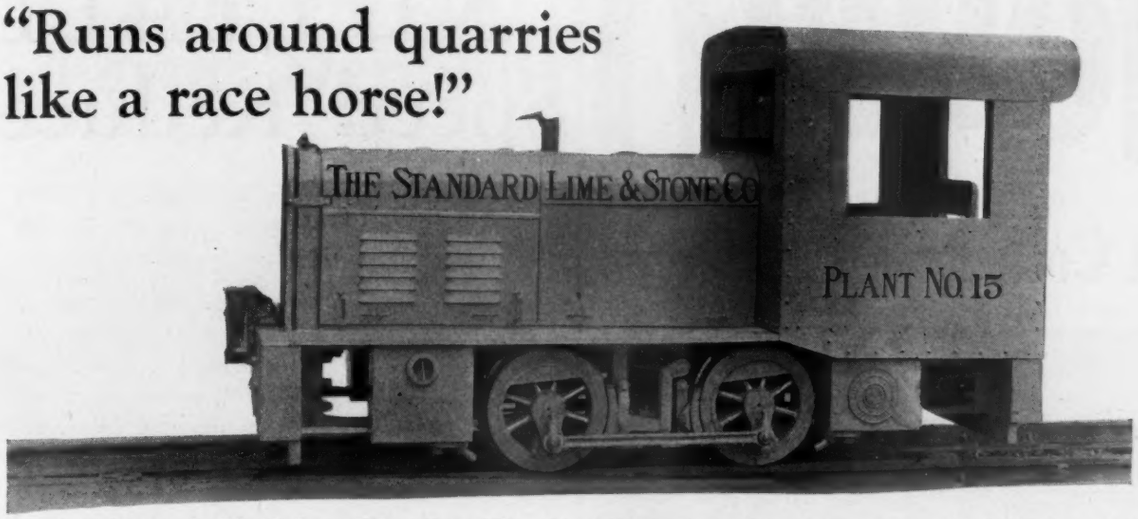


WILLIAMS "Double-Arch" Dragline—you'll never see the sides of this bucket drawing in.

G. H. WILLIAMS COMPANY
614 Haybarger Lane, Erie, Pa.
Branch Offices: New York Pittsburgh Cleveland Chicago

WILLIAMS
FAST-DIGGING BUCKETS

"Runs around quarries like a race horse!"



The Superintendent at the Martinsburg (West Va.) Mine of the Standard Lime & Stone Company states:

"Our Vulcan Locomotive runs around the quarries like a race horse. We've used other locomotives before but this one beats 'em all in speed, power, and ability to stay on the track."

This company placed their first Vulcan on the job in July, 1927. In September of the same year they put a duplicate Vulcan to work.

Every engineer who uses a Vulcan has the same good word to say about its extraordinary ease of operation and big power capacity. And every one who has used a Vulcan orders a Vulcan when he needs another locomotive.

There are a lot of reasons why—described in the latest Bulletin. Write for your copy.

New York Office
50 Church St.

VULCAN IRON WORKS
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Wilkes-Barre, Pa. U.S.A.
STEAM
GASOLINE
ELECTRIC
LOCOMOTIVES

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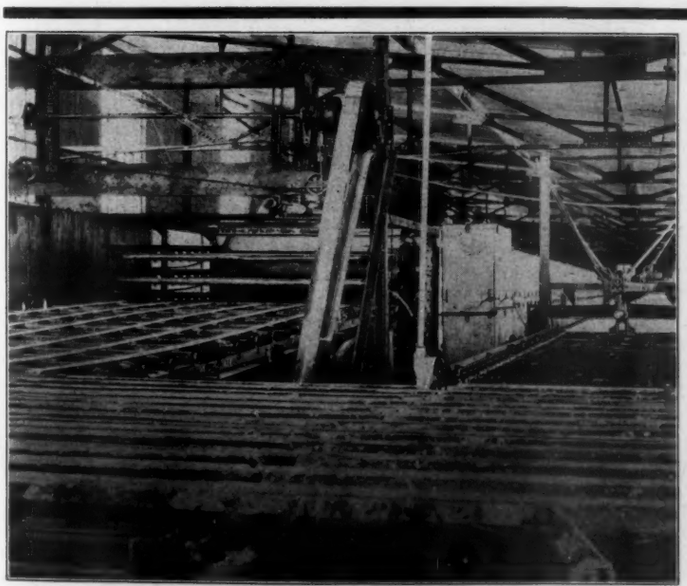


Conveyors and Cross-Conveyor Feeding Boards to Coe Dryer, Universal Gypsum Co., Akron, N. Y.

Straight Line Production Helps Profits

LARGE savings in time and labor as well as a higher percentage of marketable boards are produced by straight-line production methods, using conveyors to carry boards from the forming machine right into a

COE CONTINUOUS ROLLER DRYER

Inefficient and wasteful drying rooms and tunnel kilns are eliminated by this system. Boards are delivered perfectly flat, clean and free from defects due to improper drying processes.

Coe drying engineers will show you how to get these results in your own plant.

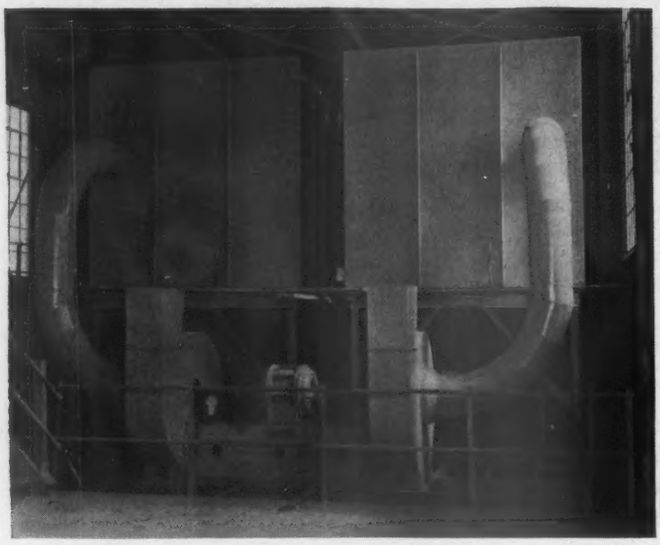
The COE MANUFACTURING COMPANY

417 Bank Street **Painesville, Ohio**

DRYING COE MACHINERY

The COE Continuous Roller Dryer—MODEL 23—*for* Boards

NORBLO
Dust Collecting Equipment



NORBLO Dust Collectors in the crusher house of Phoenix Portland Cement Co.

CEMENT plants that are DUSTLESS—where the dust is not only saved, but where expensive equipment is fully protected from the devastating effect of flying dust particles—have a tremendous advantage over less modern mills where the dust nuisance still prevails.

In a number of the most up-to-date and efficient mills of the country, NORBLO Dust Collecting Equipment is providing definite savings in materials, as well as lowering the cost of equipment maintenance.

What NORBLO is doing for others, it will also do in your own plant.

THE NORBLO GUARANTEE

We will give you complete satisfaction, and we positively guarantee NORBLO Equipment to conform to the requirements of your State Sanitary Laws and to be unsurpassed in construction and operation for the class of work for which it is intended.

Write Us for Details—No Obligation

NORTHERN BLOWER CO.
West 65th St. and Denison, CLEVELAND

NUTTALL
Speed Reducers

This speed reducer is the product of the oldest and largest company in the United States cutting industrial gears.

This speed reducer is of the vertical type, simple and compact. It is sturdily built in every detail, and it is designed to give continuous operation for many years, even on the toughest drive, requiring no attention beyond the occasional addition of oil to the case.

Helical gears, heat treated and hardened, give great strength and smooth, quiet operation; Timken roller bearings insure bearing dependability; the rigid, reinforced case assures perfect alignment of shafts and gears; and the Nuttall system of positive splash lubrication reduces maintenance to a very minimum.

Send for our Speed Reducer Bulletin No. 59

R. D. NUTTALL CO., Pittsburgh, Pa.

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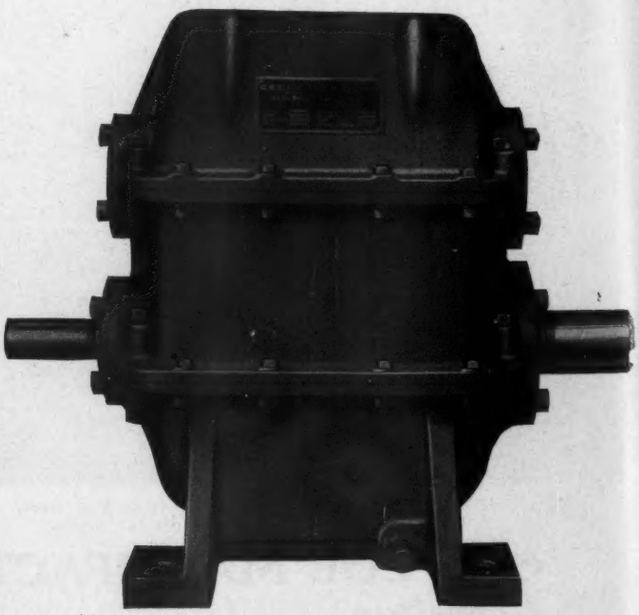

Nuttall Speed Reducer Type DVR

Nuttall

Fewer Derailments With Shays

LOCOMOTIVE derailments are often a frequent and costly annoyance. They interrupt the smooth, steady flow of stone.

Haul with Shay Geared Locomotives and you minimize the possibilities of derailments. Shays have low wheel loads and their weight is evenly distributed. They stick to rough, unballasted track.

Shays have many other advantages that are of particular appeal to quarries. Write for complete data.

LIMA

Shay Geared LOCOMOTIVES

LIMA LOCOMOTIVE WORKS

Incorporated

Lima, Ohio — 17 East 42nd St., New York

BURRELL ENGINEERING and CONSTRUCTION COMPANY

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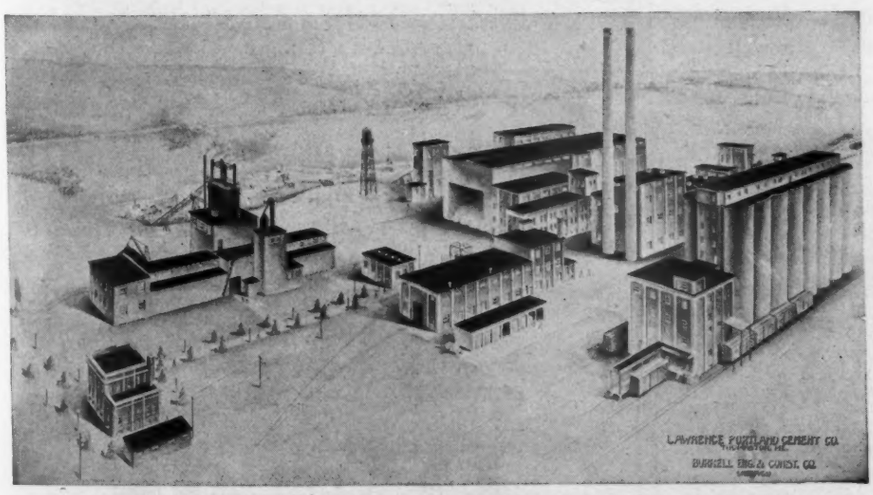

Designers and Builders of

Cement Plants, Stone Crushing Plants, Lime and Gypsum Plants, and Associated Buildings

Our artist's conception of the plant under construction for Lawrence Portland Cement Company, Thomaston, Maine, noteworthy because plant is practically concrete throughout

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Beaumont
Slackline Excavators

A slackline cableway excavator has many advantages over other systems. A few of these are:

Entire operation of digging, elevating and conveying is done by one machine operated by one man. Plant investment is kept to a minimum, as well as payroll.

Only one machine is used, consisting of a few large, rugged units, which means that maintenance costs are low. There are fewer parts to get out of order.

Long range excavating is easily accomplished with a slackline. Deep pits or underwater digging handled with equal facility.

Remember that one man and one machine does all the work, up to the screens.

Electric, gasoline, steam, or belted operation.

Complete specifications and prices will be furnished on request

Write for Catalog

R. H. BEAUMONT CO.

313 Arch Street, Philadelphia, Pa.
1544-C Straus Building, Chicago, Ill.

The only sure crusher protection is Dings Protection

The Trap Filled with Rock! Tramp Steel Free to Destroy!

WHEN the metal trap fills with rock, what will keep tramp steel—broken-off pick heads, picks, shovel teeth—from sliding by, to wreck the crusher and tie up production for days, perhaps weeks?

The only sure protection is Dings protection. All the steel and iron is caught and thrown aside by the powerful magnetic fields of Dings Separators.

Bar the way to tramp steel before it works untold damage.

Dings Magnetic Separator Co.
803 Smith Street, Milwaukee, Wis.
Established in 1899
New York, 30 Church St. Seattle, 2208 First Ave., S.
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Dings High Intensity MAGNETIC SEPARATION

RPS-3—Gray

AGITATORS for CEMENT SLURRY

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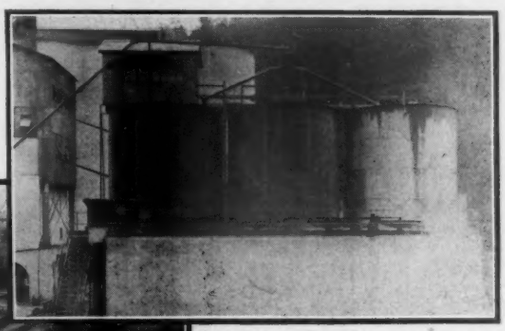

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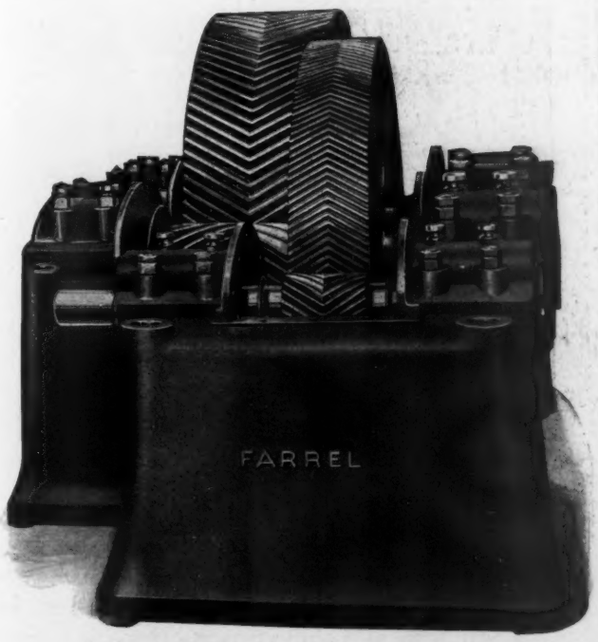

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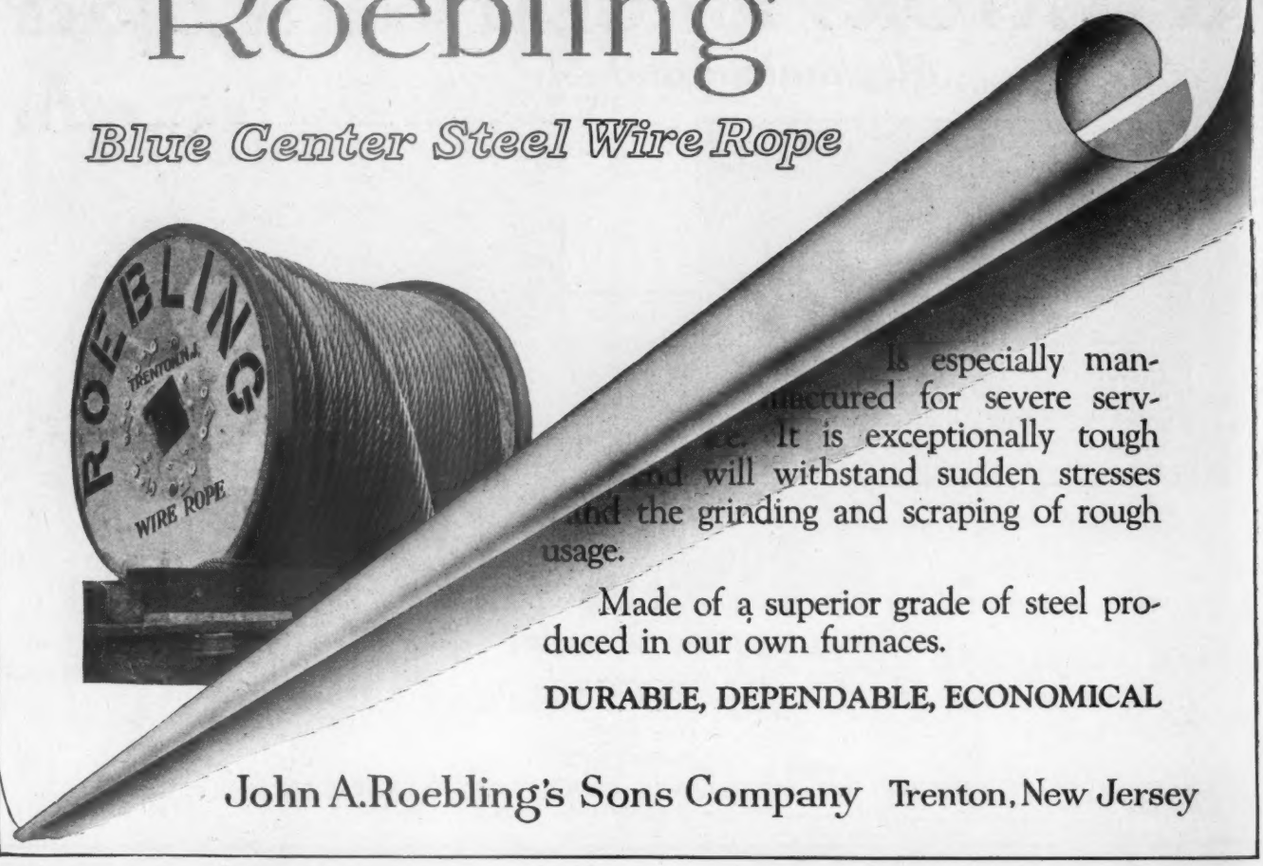

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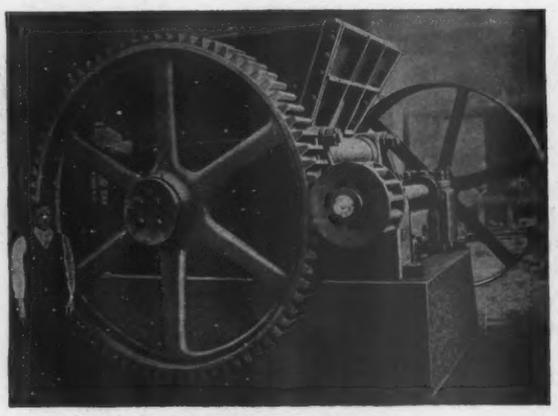

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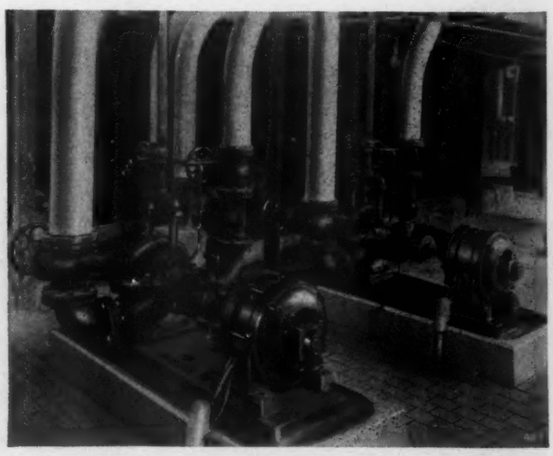

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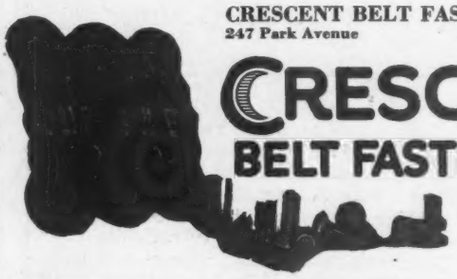

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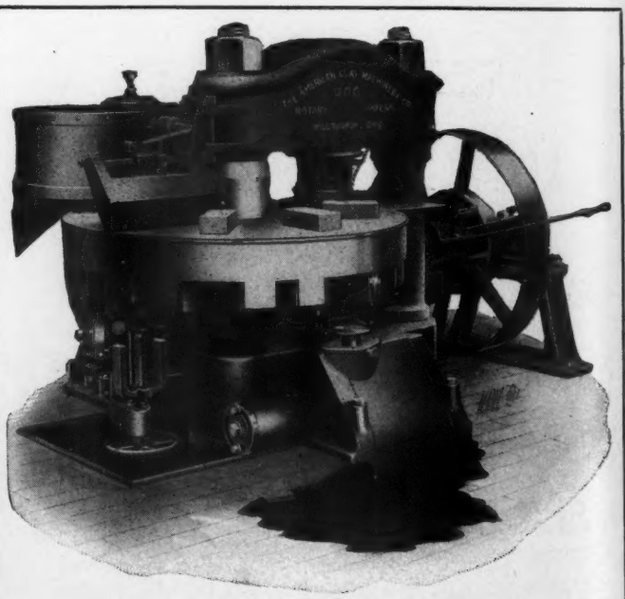

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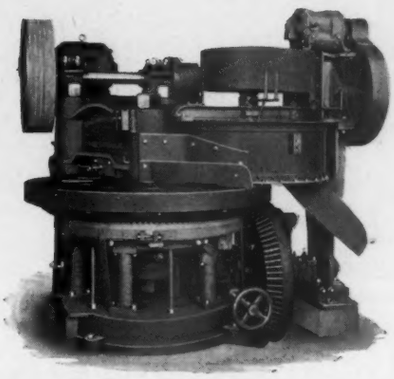

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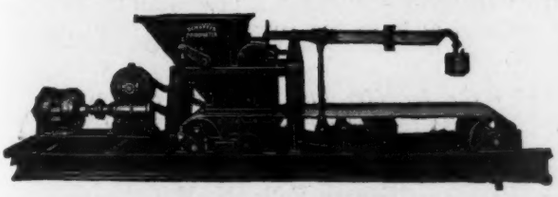

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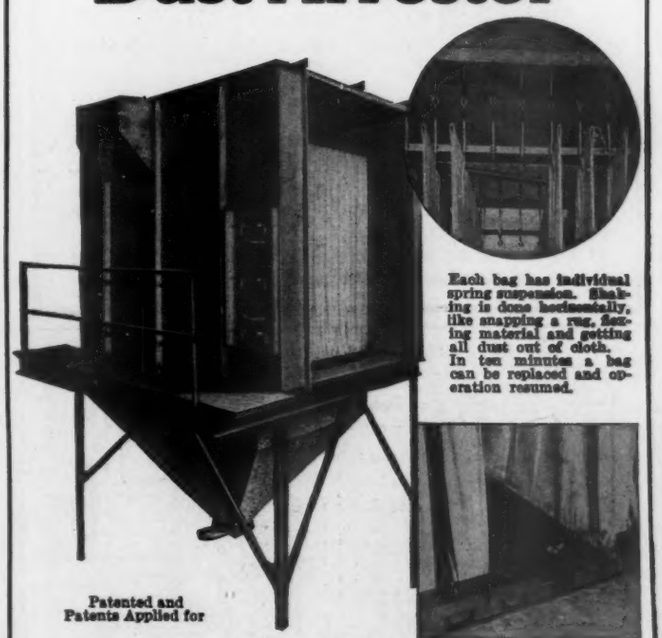

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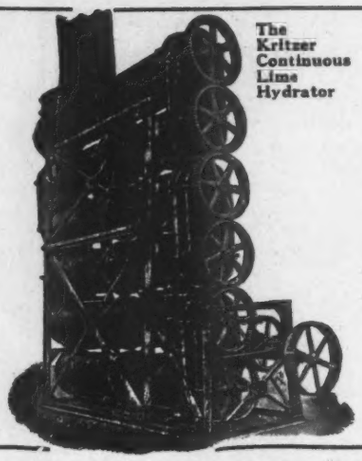

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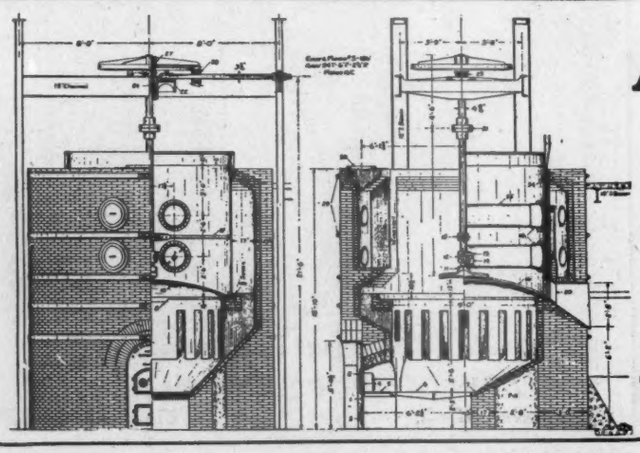

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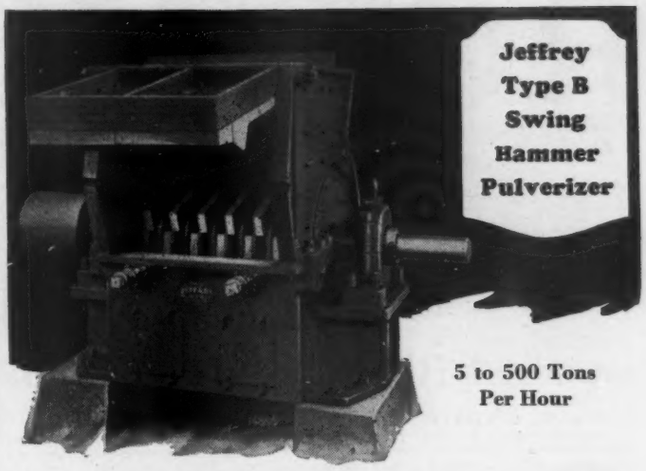

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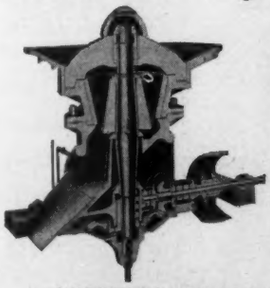

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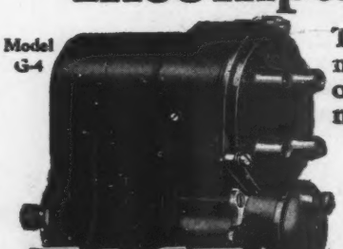

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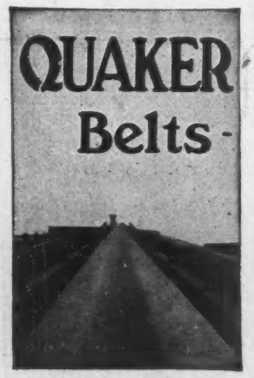

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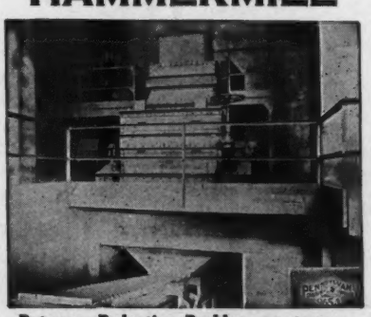

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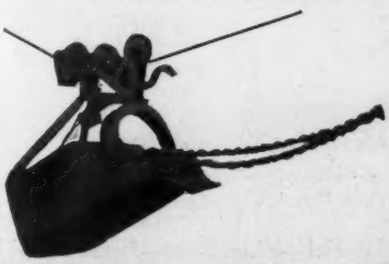

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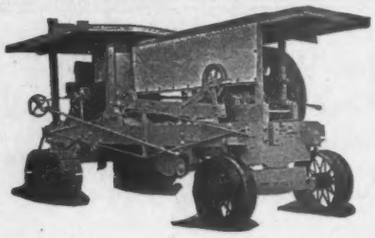

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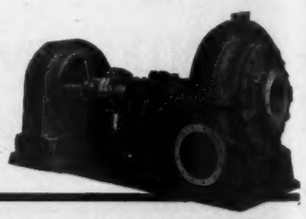
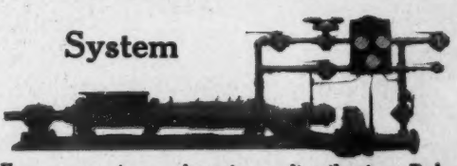
Morris Machine Works
Baldwinsville, N. Y.



FLORY
8 TO 125 H.P. HOISTS

The experiences of quarry operators of half a century are embodied in Flory Hoists. They are equipped with cut gears, asbestos frictions, and asbestos brakes. Flory Hoists represent the utmost in modern hoist construction. Single, double, and three drums.
Send for Bulletin
Flory also builds Cableways, Dredging Machinery, Steam and Electric Hoists, Carpullers, Etc.
S. FLORY MFG. CO.
BANGOR, PA.
SALES AGENTS IN PRINCIPAL CITIES

FULLER KINYON
System



For conveying—elevating—distributing Pulverized Materials through pipe lines of extended length.
Cement—Raw Material—Flue Dust—Packer Spill —Gypsum—Lime, Etc.
FULLER COMPANY
CATASAUQUA, PA. U. S. A.

DUSTY OPERATIONS MADE DUSTLESS BY PANGBORN

Consult us on any phase of Dust Suppression and Collection for any industrial operation.

Pangborn Corporation
Sand-Blast and Dust Suppression Equipment, Hagerstown, Md.

HYMAN-MICHAELS COMPANY
Headquarters for
RAILS
RAILWAY MACHINERY
CARS, ETC.

We Buy and Sell Complete Electric Railway Material and Railway Machinery, New and Relaying Rails, Motors and Turbines
Best Price—Quick Delivery
HYMAN-MICHAELS COMPANY
PEOPLES GAS BUILDING
ST. LOUIS CHICAGO SAN FRANCISCO

SLY *Dust Arresters*

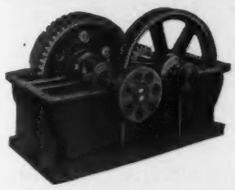
Insure Dust Free Conditions

THE W.W. SLY MANUFACTURING CO.
CLEVELAND, OHIO
OFFICES IN ALL PRINCIPAL CITIES

Hardinge Mills
Catalog No. 13A

Ruggles-Coles Dryers
Catalog No. 16A

Hardinge Company, Inc.
YORK, PA.
120 Broadway, New York City
Continental Bank Building, Salt Lake City



Fawcus Double Reduction Herringbone and Spur Gear Drive

Simplicity and economy of construction, combined with high-grade workmanship and materials has made this type of speed reducer very popular among material handling people.

Our engineers are at your service to recommend the best type of drive for your requirements without obligation to you.

FAWCUS MACHINE COMPANY
Pittsburgh, Pa.

EASTON CAR AND CONSTRUCTION CO.

Makers of QUARRY CARS

EASTON, PA. - KANSAS CITY, MO.

The Bonnot Company

Swing Hammer Mills
Bonnot-Cummer Dryers
Direct Fired Rotary Dryers
Ball Mills Tube Mills
Rotary Kilns Pulverizers

CANTON - OHIO

Rails

also—
FROGS & SWITCHES
SPIKES, BOLTS, TIE PLATES
CROSS TIES, SWITCH TIMBER
ACCESSORIES

New and Relay

Morrison & Risman Co., Inc.
McCormick Bldg. CHICAGO
1437 Bailey Ave. BUFFALO
Warehouses: Buffalo Chicago Indianapolis Pittsburgh

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT
Two cents a word Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
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USED EQUIPMENT

JAW CRUSHERS

1—30x36.
1—18x36.
1—15x24.
1—10x20.

GYRATORY CRUSHERS

1—No. 5 Austin.
2—No. 6 McCully & Gates.
2—No. 5 McCully & Austin.
1—No. 13 Telsmith.
1—No. 7½ Austin.
1—No. 9K Gates.

SYMONS DISC

1—24" Rebuilt.

HAMMER MILL

1—No. 12 Universal.

CLAM SHELL BUCKET

1—Blaw-Knox 2 yd. cap. Class 620-W, Dreadnought. Used 2 weeks.

A. J. O'NEILL COMPANY
406 Weightman Bldg. Philadelphia, Pa.

Crushers No. 12, 10, 9, 8, 7, 6, 5, 4
Roll Crushers
84x72, 36x60, 72x30, 18x30
Jaw Crushers
36x48—40x42—26x50—24x36—20x34—60x84
12x37—18x36—13x30—7x24—7x16—10x22
DISC CRUSHERS, 48", 36", 24", 18"
3 Oil Engines 200 H. P., New
Other Oil Engines, 50-850 H.P.
¾—1 AND 1½—2½-YD. CAT SHOVELS
5 Ton Crane 70' Span A C Motors
AIR COMP.—HOISTS—KILNS
DRAG LINES—LOCO. CRANES—MOTORS
Ross Power Equipment Co.
13 South Meridian St. Indianapolis, Ind.

Steam Shovel and Crusher For Sale

Owing to change in our operations we have for sale one Marion Steam Shovel, Model 21, Shop No. 4473, together with lot of spare parts, in first class second-hand condition, $3,750. Also one No. 6 McCully Crusher in good second-hand condition, $1,000. Both f.o.b. cars.

Stockbridge Stone Co., Stockbridge, Ga.

Rebuilt Dump Cars

20-yard, all steel, Western air dumps. Ten of these.
12-yard, steel underframe, hand dumps. Seven of these.
6-yard, steel underframe, hand dumps. Seven of these.

Rebuilt Locomotives

55-ton Baldwin 6-wheel switcher, separate tender, 200 lb. steam, built 1913.
43-ton Baldwin 6-wheel switcher, separate tender, 180 lb. steam, built 1917.
72-ton American 6-wheel switcher, separate tender, 180 lb. steam. Four duplicates.
42-ton American 4-wheel saddle tank, 180 lb. steam, built 1910.
31-ton Baldwin 4-wheel saddle-tank, built 1914.
21-ton Porter 4-wheel saddle tank, 165 lb. steam, built 1912, 36-in. gauge.

Rebuilt Locomotive Cranes

20-ton Link-Belt 8-wheel 2-line, built 1916.
20-ton Industrial 8-wheel, 2-line, built 1917.
22½-ton Ohio 8-wheel, 2-line, built 1915.

Birmingham Rail & Locomotive Company
Birmingham, Alabama

CRAWLER SHOVELS

1—MARION 37, STEAM, Shop No. 5550 series, new late 1926; 1¼-yd. Dipper; Nat. Board Boiler; like new.
1—LORAIN-60, GASOLINE; new July, 1927; 1-yd. Dipper; HIGH LIFT, like new.

CRANES

1—15-ton cap. LINK-BELT K-2, GASOLINE, Caterpillar Crane, new 1926; 50 ft. boom, bucket operating.
2—25-ton, 8-wheel, INDUSTRIAL, Type G, Locomotive Cranes, new 1927, 50 ft. booms.

DUMP CARS

25—5-yd., 36" gauge, WESTERN, two-way side dump, new 1927; STEEL DRAFT BEAMS; used few months; perfect condition.

Grey Steel Products Company
111 Broadway New York, N. Y.

FOR SALE

1—4'x26' Cummer Dryer.
1—5'x50' Bonnot Dryer.
2—36" Bonnot Pulverizers.
1—5'x4' Allis-Chalmers Ball Mill.
2—50-ton Coal Hoppers.
Bucket Elevators and Screw Conveyors.
J. S. LEWIS, Jonesville, Mich.

FOR SALE

1—75 H.P. Electric Stripping Outfit.
1—Gas Portable Core Drill.
1—No. 3 Gates Gyratory Crusher with Screens.
1—No. 9-K Gates Gyratory Crusher.
2—No. 8-D Gates Gyratory Crushers.
1—No. 5 Telsmith Gyratory Crusher.
1—No. 7 Williams Fine Grinder.
1—No. 7½-D Gates Gyratory Crusher.
1—18"x36" Farrell Jaw Crusher.
1—36"x48" Traylor Bull Dog Crusher.
1—No. 6 Austin Gyratory Crusher.
2—No. 5-K Gates Crushers.
1—Complete 400 Yard Gravel Plant.
1—Complete Small Stucco Plant.
1—6'x22" Hardinge Conical Ball Mill.
1—41-ton Baldwin Standard Gauge Locomotive.
2—Complete ¾-yd. Gas Cableway Outfits; 1 steam.
1—Sauerman 1-yd. Outfit, without power.
1—Sauerman 2-yd. Electric Outfit, complete.
1—New 200 H.P. G. E. Motor.
1—65' Center Bucket Elevator.
50—Steam and Electric Channelers.
1—33" Fuller Mill.
1—3'x30' Indirect Fired Dryer.
1—42" Gas Whitcomb Locomotive.
1—150' Matthew Gravity Conveyor.

Send us your inquiries and we will send you our offerings from our $15,000,000 Listing.

National Equipment Company
Bloomington, Indiana

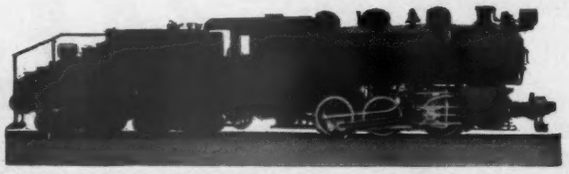
Machinery for Sale

JAW CRUSHERS—2½x4; 4x12; 8x10; 9x15; 10x20; 12x24; 13x30; 24x36; 30x42; 60x84.
GYRATORY CRUSHERS—All sizes, various makes.
CRUSHING ROLLS—8x5; 20x14; 21x11; 24x10; 24x14; 30x16; 36x16; 42x16.
DRYERS AND KILNS—Single shell—3½x16; 4x20; 4x30; 4'9"x36; 5x25; 5x50; 5½x40; 6x40; 7x70; 7x100; 8x80; 9x124; Double shell—3x16; 4x20; 5x30; 6x40; 8x85.
TUBE MILLS—3'x12", 4x16; 5x20; 5x22; 5'6"x16; 5'6"x20.
HARDINGE MILLS—3'x8"; 4½x16; 5x22; 6x22; 8x30; 8x36; 8x48.
PULVERIZERS—2-, 3-, 4-, 5-roll, high and low side Raymond Mills, also Beater types; 33" to 42" Fuller Lehigh Mills, Griffin Mills.
SWING HAMMER MILLS—All sizes—Williams, Jeffrey, Gruendler, Pennsylvania.

Send us your inquiries

Consolidated Products Company, Inc.
15-16-17 Park Row New York City
Barclay 0603
Send us a list of your surplus machinery

FOR SALE



75-ton, 21x26 in. American Locomotive Co. 6-Wheel Switcher, BUILT DECEMBER, 1922; piston valve; Walschaert valve gear; Alco power reverse; superheated; tractive power about 36,000 lbs.; steel wheel centers; steel running boards; steel cab; steel tender frame; electric headlights both ends; flexible staybolts. Complies all I. C. C. requirements, etc. READY IMMEDIATE SHIPMENT.
17—16-yd. WESTERN, heavy duty, steel beam type, 2-way dump cars. Some air, some hand dump. Rebuilt with entire new bodies, steel lined floors.
10—20-yd. WESTERN, all steel, two-way air dump cars; vertical air cylinders.
1—50-B Bucyrus Steam Shovel on caterpillars.
HAVE OTHER EQUIPMENT OVERHAULED AND READY
SOUTHERN IRON & EQUIPMENT CO. *(Est. 1889)* **ATLANTA, GA.**

Sell your discarded equipment! It's probably worth more than you realize. Try an advertisement in this section.

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT
Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

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USED EQUIPMENT

CARS
8—12-yd. Std. gage Western Dump.
6—20-yd. Std. gage Western Dump.
30—4-yd. 36" ga. Western Dump.
25—1½-yd. 24" ga. Western Dump.
70—1½-yd. 24" ga. Koppel Steel V Shape.
3—7-ton, 24" ga. Plymouth Gasoline Locos.

BOILERS
2—70-h.p. Brownell Fire Box type, 100-lb.
2—150-h.p. Springfield Scotch Marine, 130-lb.

AIR COMPRESSORS
3—210-ft. Chicago-Pneumatic direct connected to oil engine.

HOISTS
1—7x10 Lidgerwood C.C. D.D.
1—8¼x10 American 3 Drum with boiler.
2—82-h.p. Clyde Single Drum, drum 26"x30".
1—Derrick, steel boom 80-ft., 10 tons with 3-Drum hoist and swinger.

OIL STORAGE TANKS
8—8000-gal. Tank car tanks.
3—25,000-gal. Vertical Round steel tanks.

CRANES, SHOVELS
20-ton Browning 8-wheel loco. crane.
1½-yd. 35-B Bucyrus Steam Cat. Shovel.
No. 5 and 8 Gyratory Crusher.

HYMAN-MICHAELS COMPANY
People Gas Bldg., Chicago, Ill. — Railway Exc. Bldg., St. Louis, Mo.

FOR SALE
1—5'x6' Edison Giant Roll.
200 tons 60 lb. Relaying Rails.
1—2"x6" Laboratory Jaw Crusher.
1—Set 36"x30" Smooth Rolls.
1—Set 18"x24" Spike Rolls.
2—10' Morgan Gas Producers.
2—8'x6' Ball Mills.
3—No. 5 McCully Gyratory Crushers.
1—No. 7½ Kennedy Gyratory Crusher.
5—8'x125' Rotary Kilns.
1—9'x100' Rotary Kiln.
1—7½'x80' Rotary Kiln.
5—5'x50' Rotary Coolers or Dryers.

Equipment Sales Company
Richmond, Virginia, and Benson Mines, N. Y.

MACHINERY FOR SALE

ROTARY CRUSHERS
Three No. 0, Three No. 1, One No. 1½, One No. 2 Sturtevant Rotary Fine Crushers, Three No. 0, One No. 1 Sturtevant Ring Roll Mill, One No. 2 Duplex Sturtevant Ring Roll Mill.

GYRATORY CRUSHERS
All sizes from No. 2 Reduction up to 12K.

JAW CRUSHERS
One 2"x6", Two 7"x10", Two 9"x15", One 6"x20", One 10"x15", One 10"x20", Two 12"x24", One 13"x30", One 15"x36", One 18"x36", One 24"x36", One 22"x50", One 36"x48", One 40"x42", One 60"x84".

CRUSHING ROLLS
One 8"x6", Two 16"x10", Three 30"x10", Two 36"x16", Two 42"x16", One 54"x24", Two 14"x20", and One 24"x12" Crushing Rolls.

DRYERS
One 3'x20', Three 4'x30', One 5'x40', Two 5½'x40', One 6'x60', One 7'x60', and Two 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30' Ruggles Coles type "A" and One 4'x20' Ruggles Coles type "B" Double Shell Rotary Dryers, Three 6'x25' Louisville Dryers.

KILNS
One 4'x40', Two 6'x60', Two 6'x90', One 6'x100', One 6'x120', One 7½'x80', Three 8'x125'.

HARDINGE MILLS
Two 3', Three 4½', Three 6' and Two 8' Hardinge Mills.

SWING HAMMER AND TUBE MILLS
Fuller, Griffin and Raymond Mills, Screens, Air Separators, etc.

SPECIAL
One No. 6 Williams Universal Pulverizer.

THE HEINEKEN ENGINEERING CORP.
95 Liberty St. — New York City
Telephone Hanover 2450

In stock 250—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge: rails, new and relaying and all sorts of tracks supplies of all sections.

Park Row Bldg., New York City — **M. K. FRANK** — Union Trust Bldg., Pittsburgh, Pa.

WE SELL NEW AND REBUILT
Blake Type Jaw Crushers
Cornish Crushing Rolls
Trommel Screens
Elevators and Conveyors
Drag Line Hoists
Air Compressors
Piston Rock Drills
Jackhammer Drills
Complete Crushing Plants
Complete Screening Plants
Rock Asphalt Plants

"WHAT ARE YOUR NEEDS"

E. A. MARTIN MACHINERY COMPANY
Phone 2117 — Joplin, Mo.

Machinery For Sale
Immediate Shipment—Attractive Prices

1—5'6"x50' Renneberg Direct Heat Rotary Dryer.
2—7'x7' Gates Ball Mills.
1—4'x16' Smidth Tube Mill, brick lined.
1—No. 6D Gates Gyratory Crusher.
1—5'x22" Hardinge Conical Mill.
1—24"x36", Style D, Jeffrey Hammer Mill.
3—Sets 20x14" Sturtevant Granulating Rolls.
1—Set 36x16" Sturtevant Balanced Rolls.

If you don't see what you require—inquire

UNITED UTILITIES, Inc.
17 W. 60th Street — New York City

500 Tons

30 lb. Rails
Reconditioned
and serviceable as new

Priced to sell now
and all other weights

ZELNICKER IN ST. LOUIS

3—Clyde 82 H.P. Single Fric. Drum Electric Hoists.

Drum 26-in. diam. x 30 in. face; 82 hp. G. E. hoist, motor 3 ph., 60 cy., 220-440 volts, duty 7000 lb. hoist; 300 ft. p. m.; steel gears. Like new. For inclines, car pullers, hoisting, etc.

Hyman-Michaels Co.
Peoples Gas Bldg., Chicago, Ill. — Railway Exchange, St. Louis, Mo.

FOR SALE
SPECIAL—Gypsum calcining and mixing plant consisting of 4-roll Raymond Mill; 4½ x 52½ ft. Calciner; 4x30 Ruggles-Coles Dryer; 3 Broughton Mixers, Style A-1, A-2, B-1; Hair Picker; 30 and 36 in. buhr-stone mills.
4x30 American Process steam dryer.
42"x40' rotary kiln.
8'x80' single shell dryer.
Raymond Mills, roller and beater type.
6x22 and 8x48 Hardinge Mills.
4½x12 ft. Allis-Chalmers Tube Mill.
Infant, No. 2 and No. 6 Williams Mills.
5x30, 80"x45' and 8' 8"x85' Ruggles-Coles Class A Dryers.

Robert P. Kehoe Machinery Company
7 East 42nd Street — New York, N. Y.

FOR SALE—DODGE CRUSHER
Complete with cast steel jaw plate, 7"x9" —used about a year. Manufactured by Allis-Chalmers Co.

CENTRAL SUPPLY HOUSE
41 North Water St. — Rochester, N. Y.

FOR SALE
20-ton Vulcan Locomotive, 11x16, standard gauge, A.S.M.E. Boiler, Shop No. 2986, saddle tank, in perfect condition.

H. P. GUION
50 Church St. — New York, N. Y.
Cortlandt 0774—2840

CLASSIFIED ADVERTISEMENTS

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Two cents a word Set in six-point type. Minimum $1.00 each insertion, payable in advance.

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USED EQUIPMENT

FOR SALE

7½-TON ORTON GAS CRANE—40-ft. boom, caterpillar; equal to new; overhauled; genuine bargain; located Chicago.

Address
Box 110, care of Rock Products
542 So. Dearborn St., Chicago, Ill.

MACHINERY FOR SALE

8—4-yd. 36" gauge, wood side dump cars.
1—4-ton 36" gauge Milwaukee Gas Locomotive.
1—7-ton 36" gauge Plymouth Gas Locomotive.
1—Thomas 2-speed hoist with motor.
1—1½-yd. Class X Sauerman bucket and carrier assembly.
1—1½-yd. Pioneer Drag Cable bucket.

COON RIVER SAND COMPANY
Des Moines, Iowa

Bargain Prices
100,000 Lbs. Capacity
ALL STEEL ORE HOPPER DUMP CARS
MCB condition. Ready for service.
Cheap freight to any part U. S. A.
DULUTH IRON & METAL COMPANY
Duluth, Minn.

1—O. & S. Crane, 40 ft. boom, ¾-yd. clam bucket, 2 years old.
1—Portable Crescent Scraper, ¾-yd. bucket, 25 hp. G. E. motor, 220 v., 60 cycle, 3 phase; mounted on wheels.
1—⅜-cu. yd. Sauerman 2-speed Electric Drag Line, 60 hp. motor, 220 v., 60 cycle, 3 phase, A.C. current. Equipped with roller bearing sheaver. This equipment all in good condition. Will sell reasonable.

ANDERSON-SAND-GRAVEL CO., Inc.
Rockford Illinois

FOR SALE

120 H.P. Solid Injection Anderson Oil Engine, Type K, No. 4100, in good condition.

Tulsa Sand Company
Tulsa, Oklahoma

FOR SALE

One Mead-Morrison two yard Dragline Hoist, 100 HP. Lincoln motor, 3-phase, 60-cycle, 220 volts. Used in the production of only 200,000 tons of material.

SCULLY SAND AND GRAVEL CO.
118 First Street Cambridge, Mass.

Used Equipment

Sell your discarded equipment! It's probably worth more than you realize. Try an advertisement in this section.

USED EQUIPMENT

FOR SALE

Shovel—Bucyrus 50 B, Cat. mounted.
Locomotive—35 ton 4 wh. saddle tank.
Dryers—3 Ruggles A 18—bargains.
Stiff leg derrick with electric hoist.
Orange Peel Bucket, 1½ yd. Kiesler.

A. V. Konsberg, 312 S. Clark St., Chicago

RAILS New and Relay
ALL WEIGHTS AND SECTIONS
FROGS—SWITCHES—TIE PLATES
S. W. LINDHEIMER
38 S. Dearborn St. Chicago, Ill.

UNIVERSAL CRUSHER COMPANY
Eastern Agents

All Steel Jaw Crushers. Also used equipment in crushing and power lines.

HOOPER-MOMBERGER CO.
90 West St., New York City Phone Rector 2919

USED EQUIPMENT WANTED

Wanted for Immediate Delivery

1—No. 4 Eight inch
1—No. 5 Ten inch
1—No. 6 Twelve inch Gyratory Crushers.

Must be in good condition and preferably Central States location. Write or wire description, location and price.

BOEHCK MACHINERY COMPANY, Inc.
2404 Clybourn Street Milwaukee, Wisconsin

WANTED

50 H.P. or more Gas Hoist and 1½ yd. Bucket for Drag Line in sand pit.

Hoffman Construction Company
Bernardsville, N. J.

SHOVEL WANTED

Marion or Bucyrus, 2¾ or 3 yd. mounted on caterpillars, Electric preferred. Give shop number and year manufactured. State price and terms.

The Callanan Road Improvement Co.
South Bethlehem, N. Y.

Wanted—Used Hammer Mill

For reducing lime stone to ¼-in. to 0; capacity 10 to 15 ton per hour. Make, shop number, location and price required.

GEORGE & EMSWELLER
New Salem, Ind.

Used Equipment Wanted

If in need of good used equipment make your wants known here and see how quickly you can fill them at reasonable cost.

USED EQUIPMENT WANTED

WANTED

Clyde Hydrator and Raymond No. 1 Pulverizer complete, or complete hydrating plant equipment. Give complete specifications and best price of each piece of equipment. Address

Box 118, care of Rock Products
542 South Dearborn Street Chicago, Illinois

BUSINESS OPPORTUNITIES

Quarry for Sale

Hard lime stone quarry, 600 tons capacity, in southeastern Pennsylvania, completely equipped, well situated, near city of 100,000 population; large demand for product for state, county and township highways and building construction. Property will be sold at a very reasonable price. Complete information on request.

Box No. 117, care of Rock Products
542 So. Dearborn St. Chicago, Ill.

FOR SALE

At equipment inventory, one-half interest in paving business, central New York. Original company in operation twenty-two years. Either practical or office man desired. Address

Box 116, care of Rock Products
542 South Dearborn St. Chicago, Ill.

For Sale—Sand and Gravel Plant

Well established sand and gravel plant in eastern Arkansas on Rock Island R. R. Lots of business in sight. For particulars write

W. A. BRIDEWELL
622 Falls Building Memphis, Tenn.

PARTNER WANTED

Sand lime brick plant, building of steel frame and brick, unlimited amount of pure silica sand, make a fine hard brick, all machinery ready to run, cheap labor. No brick plant nearer than 80 miles. Albany alone uses a good many millions of brick each year.

ALBANY BRICK CO., Albany, Ga.

WANTED

Man with some capital to invest in crushing plant.

Address Box 114, care of Rock Products
542 South Dearborn St. Chicago, Ill.

If you have a business to sell or lease, or if you wish to buy or lease a business, you will be doing yourself a good turn by placing an advertisement in this department.

CLASSIFIED ADVERTISEMENTS

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Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

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BUSINESS OPPORTUNITIES

For Sale, Lease or Royalty

Limestone Quarry & Crushing Plant, Capacity 60 ton per hour. Located in Eastern Ontario, near Ottawa, on C. P. R. tracks, in heart of good market. Owner unable to give required attention. A lifetime opportunity for young man waiting for it.

Address Box 119, care of Rock Products
542 South Dearborn St. Chicago, Ill.

SITUATIONS WANTED

PACIFIC COAST SALES ENGINEER AND district manager wishes to affiliate with a live organization supplying machinery or equipment to cement, plaster, lime and grinding plants, having held a position as Pacific Coast Manager with a well known organization in Chicago for seven years. Desires to make change. Is in personal touch with all the operators and executives in this territory from El Paso, Texas, to Edmonton, Canada, including Denver. Thoroughly familiar with all plant operations. Address Box 2271, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

POSITION DESIRED BY SUPERINTENdent qualified through long experience to successfully handle any crushed stone or gravel operation. Thoroughly familiar with every phase of the business, including plant design and construction. Dependable and practical supervision given the work at all times. Several years experience in extensive production of hard rock. Locate anywhere. Satisfactory references. Address Box 104, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

Those seeking positions can readily find them by making their wants known to a large number of employers who read the advertisements in this section.

SITUATIONS WANTED

WANTED—POSITION AS CHIEF CHEMist in cement plant. Have had broad experience in the cement industry with 18 years actual operation. Thorough knowledge of quarry and mill supervision, burning with oil or coal, wet or dry process. Age 37 and married. Can furnish complete record with best of reference. Address Box 100, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

AVAILABLE, YOUNG MAN WITH BROAD experience as production clerk and assistant superintendent wishes to make permanent connection with company that will recognize executive ability in the handling of plant shipments, payrolls, operating costs, books and correspondence. Familiar with all phases of crushed stone industry. An adaptable and energetic hustler that can assure efficient results. Address Box 96, care of Rock Products, 542 So. Dearborn Street, Chicago, Ill.

SUPERINTENDENT — DESIRES ENGAGEment; thoroughly familiar with stone crushing, sand and gravel operations; competent and efficient operator; location South or West. Prefer working on bonus basis or tonnage contract. Excellent references. Address Box 99, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

ENGINEER, EXPERIENCED IN DESIGN, construction and operation; cement, lime, crushing, pulverizing, conveying, ore handling and treating plants. Considerable experience in other industrial manufacturing lines. Address Box 2253, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

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SITUATIONS VACANT

SALESMAN—HIGH GRADE YOUNG MAN with knowledge of crushed stone and gravel operation, with some selling experience, willing to make one to three week trips in Central and Southern territory. Write us your experience and any other information. Address Box 111, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

WANTED — CRUSHING PLANT SUPERINtendent. One with a wide experience in quarry, mill and handling men; one that can get full production at lowest cost. Give reference and salary desired in first letter. Address Box 115, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

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